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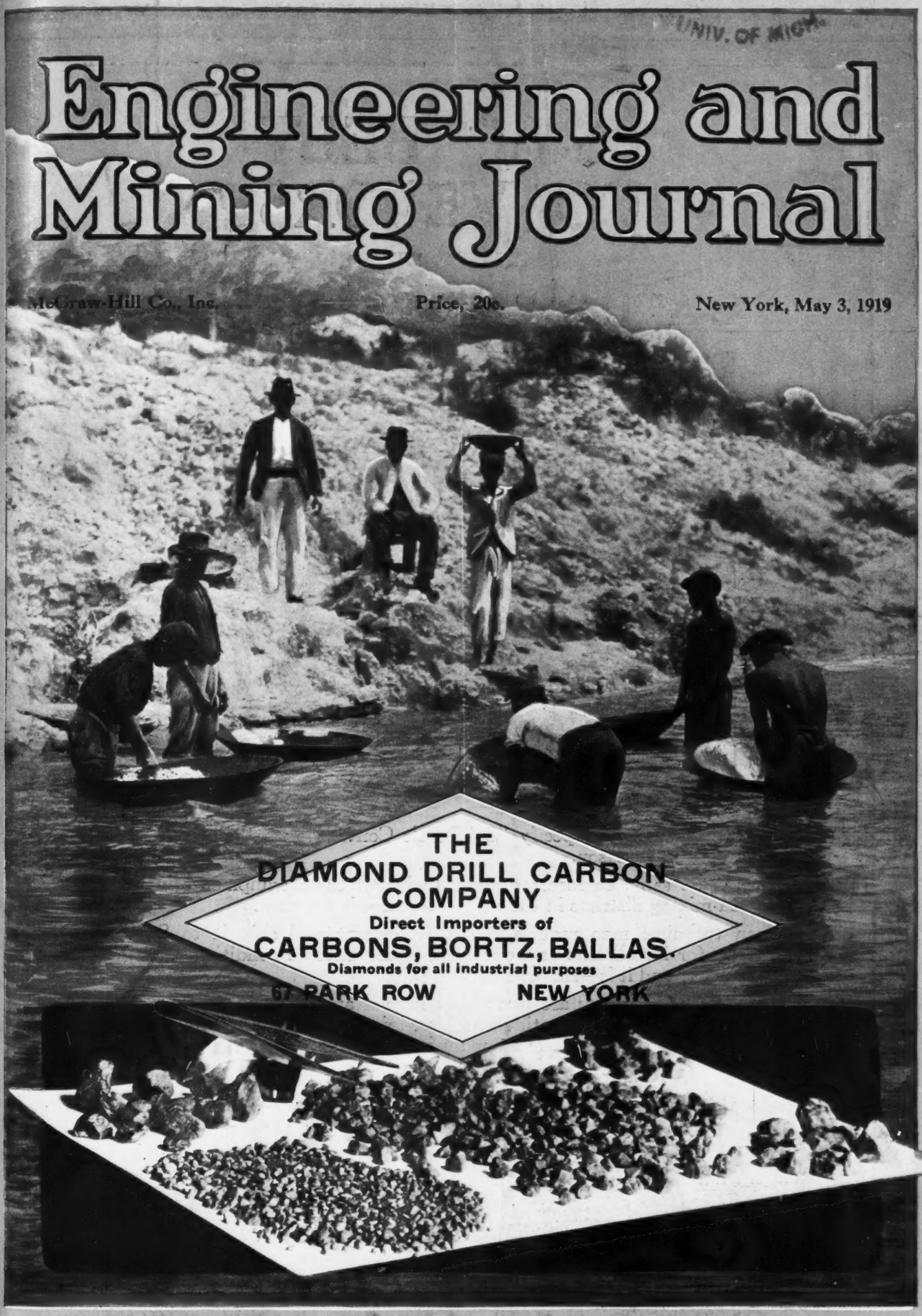
McGraw-Hill Co., Inc. Price, 20c. New York, May 3, 1919



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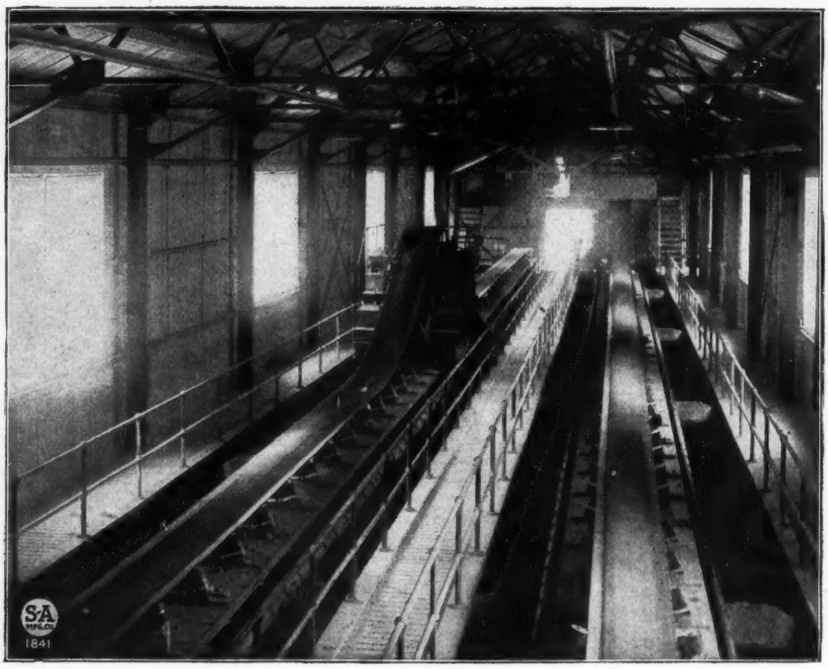

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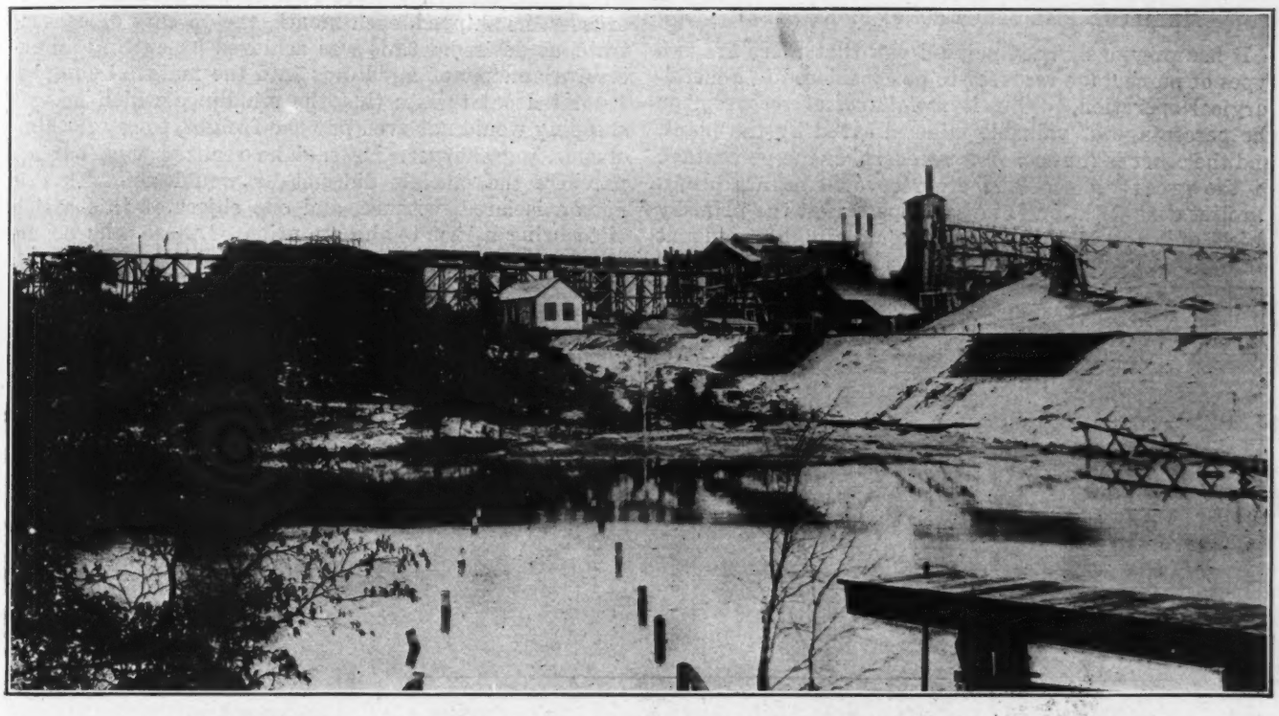
Volume 107 *Number* 18



THE CONCENTRATOR AT MINE LA MOTTE, MISSOURI. WATER RESERVOIR IN FOREGROUND

Economics of Concentration

BY A. P. WATT*

In this paper the pertinent question as to the economic aspect of concentration is considered, and abundant evidence is presented to show that technical efficiency and metallurgical recovery of concentrate are not the sole subjects for consideration. It is to be regretted that the relative worth of extraction and recovery figures is not better understood, and that there are frequent instances as our contributor points out, where those in control will insist on a so-called improvement of a certain phase of the process without paying any attention whatever to the economic aspect of the proposed change. The suggestions as to the advisability of operating a separate re-treatment plant are worthy of consideration, and the contentions made in relation to this matter are supported by ample evidence in favor of such procedure where it is practicable and where the highest operating efficiency is desired.

THE increased cost of smelting, together with the high prices of labor and supplies, makes it imperative that more study be given to the economics of concentration. Within the last few years prices have increased enormously; and to make the maximum profit it is necessary that attention be given to the subject of the most economic grade of concentrate to be shipped to the smeltery.

The question of metallurgical extraction in various concentrating plants has received ample notice, but only a small amount of attention has been given to the study of the grade of concentrate produced. Although every mill superintendent places reliance on extraction results, few ever consider, and many do not realize, that the grade of the concentrate is also a vital factor.

Smeltery returns depend entirely upon the grade and tonnage of the concentrate produced. It is just as important to have efficiency considered in the treatment of the concentrate as in the milling of the ore. The latter phase is only half the story; and although, generally speaking, increased metallurgical extraction is desirable, it must not be overlooked that the grade of the concentrate and the costs of smelting deserve greater consideration than has commonly been accorded to these subjects.

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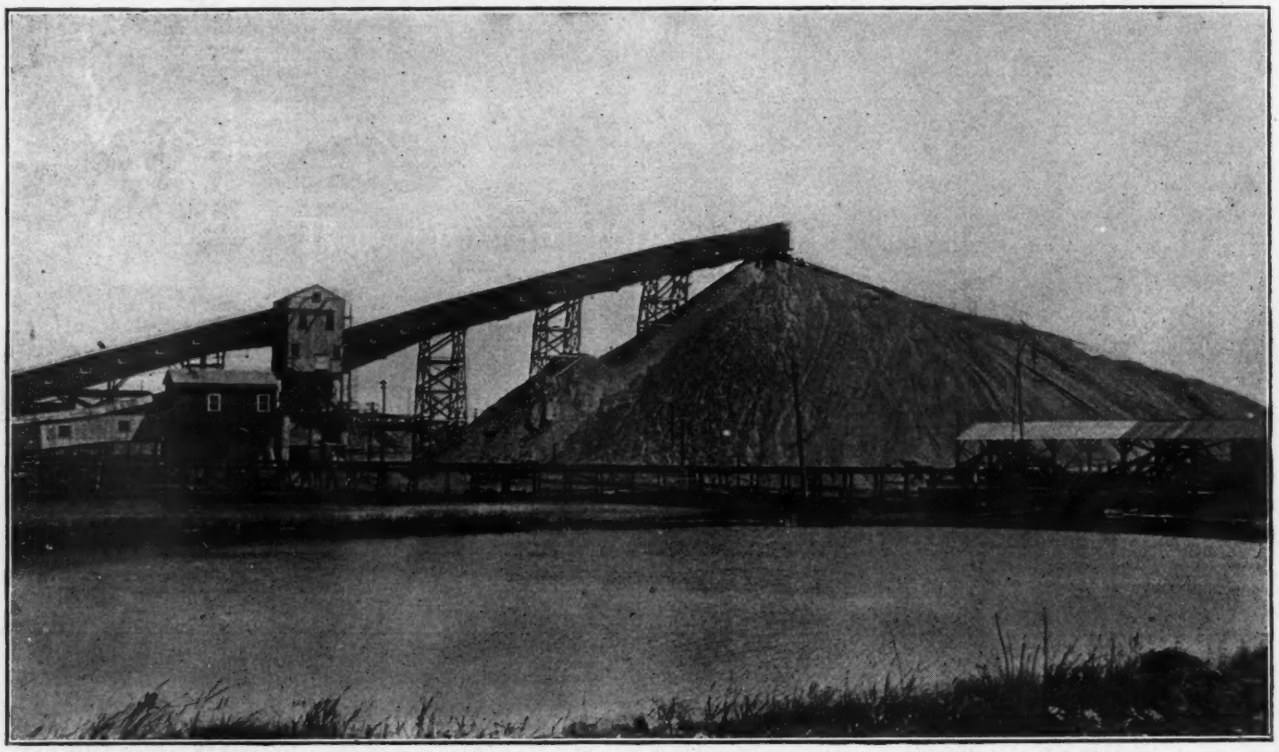
The economic conditions in the business world have changed so much within the last few years that a careful study should be made of how profits from an operating plant have been affected. With metal prices rapidly decreasing, and as a result of high labor costs, it is apparent that some change should be made both with regard to the grade of the concentrate and to the metallurgical extraction, if maximum profit is to be obtained.

Metallurgical and Economic Recovery

It has previously been pointed out[1] that there are two types of percentage recovery to be considered in a metallurgical operation. One is *metallurgical recovery*, or the percentage of valuable mineral saved by the plant, and the other is the *economic recovery*, or the percentage of the gross value of the ore recovered as net profit. On first consideration it might appear that the primary object of concentration is to recover the highest amount of mineral in the ore. If this were true, the percentage of recovery of the valuable mineral would be the index of efficiency of the plant. This condition may or may not be true, but it does not necessarily follow that increased metallurgical recovery means increased profit. A plant making a low metallurgical recovery may be operating at a profit, whereas a higher recovery might mean an actual operating loss. This condition applies particularly to small mills treating low-grade ores carrying metal of low price. As the object of concentration is to make money, metallurgical recovery is of far less importance than economic recovery.

The metallurgical recovery in every plant is usually closely watched, both by the operating force and by the officials. Many operators do not realize that there is such a thing as economic recovery. On the other hand, many mill superintendents are so pressed by their executives that their one and only object is to ship the maximum amount of product each month, irrespective of the profits.

A case recently came to my attention in which the mill superintendent was forced to ship 15 cars of concentrate per month. It was impossible for him to do this with normal-grade concentrate, because of the low grade of the ore and the small tonnage being sent to the plant. However, as the officials of the company wrote him that they were looking for results and not excuses, he shipped, each month, the 15 cars of concentrate, as desired. This was achieved by cutting an excessive amount of middlings into the material shipped. I pointed out to him that the middlings which he was shipping would not even pay the freight, to say nothing of smelting charges. He said he realized this, but apparently the officials did not or would not. This is not an isolated instance, and one object of this article is to bring a fact to the attention of those who do not appreciate it, viz., that a large tonnage of concentrate does not necessarily mean increased profits.



THE "CHAT" DUMP OF THE ST. LOUIS SMELTING AND REFINING CO., ST. FRANCOIS, MISSOURI

In the consideration of economic recovery there are a great number of factors to be resolved, and the problem is much more complex than would be apparent unless a careful study had been made. It is not possible continuously to operate a plant in such a manner as to give maximum results, for the reason that conditions change so frequently that the most efficient economic recovery possible is never achieved.

This paper will deal more particularly with the economics of lead-ore treatment in those cases where concentrates have been produced by gravity methods. The principle involved is applicable in the case of all ores, but the greatest field for consideration is under market conditions in which the metal is selling at a low price and the smelting charges are high. The same principle applies to the treatment of flotation concentrate.

When copper was selling at 26c. per lb., and the smelt-

[1]Caetani, *Mining Magazine*, Aug., 1913.

ery was close to the point of production, the question of the most economical grade of concentrate was not a serious one. However, with lead selling at 5c. per lb., and with increased freight and smelting charges, a considerable field is open for investigation in the matter of increasing the profits accruing to the shipper.

It should be realized that, in this paper, specific attention is given to lead ores, and all calculations are based on pre-war prices. The article will serve to point out a means of studying the re-treatment of concentrates, and will show the means of attacking each individual problem. Before proceeding with the question of the most economical grade of concentrate, it is expedient to consider a typical product. Any concentrate can be divided into three parts, which for convenience of reference may be termed, respectively, low grade, medium grade, and high grade.

The low-grade portion is the material that cannot be shipped to the smeltery at a profit. It is evident that a product must carry a certain amount of lead if it is to pay the cost of handling, of freight, and smelting. If a product is shipped containing this critical amount, no profit is made by the shipper, and no loss incurred, but if it contain less, the shipment is made at a loss to the shipper. Consequently the first item to be considered is the critical point in question.

This point will depend on a number of variables, such as the operating expense, the cost of freight, the terms of the smelting contract, and the selling price of lead. If all these items are considered as constants, with the exception of the selling price of lead, then the critical assay will vary inversely as the price of lead. This shows that as the price falls, the point of disappearing returns, as regards the assay of the product, will increase. With lead selling at 3c. per lb., the critical assay, under certain conditions, was 22% lead; whereas with 8-c. lead the critical assay was 9% lead.

Generally speaking it is impossible to beat the smelter. If a product will not pay its own way and return a profit, it cannot be mixed with high-grade material and shipped to a smeltery and a profit made on the previous non-profitable material. This statement applies, of course, only when the same smeltery contract is operative in both cases. Frequently, in a desire to obtain high metallurgical extraction, much low-grade material is mixed with the higher-grade concentrate in an attempt to smuggle it into the smeltery, thinking that the shipper is beating the smelter at his own game. To demonstrate that low-grade material cannot pay its own way, and will not do so even if mixed with high-grade material, the following example is given:

Assume that the freight rate is $1.50 a ton from the mill to the smeltery, and that the smelting charge is $6 a ton on a basis of 70% lead concentrate, and that 10c. a unit is added to the smelting charge for each unit of lead, in the product, less than 70%. Assume that the smelter pays for 90% of the lead, and that the selling price of lead is 4c. per lb. Assume, further, that 10 tons

SMELTING ONE TON OF MIDDLING CONTAINING 10% LEAD

Gross value 200 lb. of lead at 4c		$8.00
Freight	$1.50	
Smelting charge, $6 plus 60 x 10c	12.00	
Smeltery deduction, 10% of $8	.80	
Total charge	$14.30	
Gross value	$8.00	
Loss to shipper	$6.30	

of 70% lead concentrate is mixed with 1 ton of middling containing 10% lead. That 10% lead middling cannot be shipped at a profit is shown by the preceding table.

It is thus seen that shipment of this low-grade material has resulted in a loss to the shipper. Had it been mixed with the higher-grade concentrate, the economic recovery of the plant would have been lowered in an attempt to increase the metallurgical extraction.

By considering the smelting of 10 tons of lead concentrate containing 70% lead, the following appears:

SMELTING 10 TONS OF LEAD CONCENTRATE CONTAINING 70% LEAD

Gross value 7 tons of metallic lead at $80		$560.00
Freight, 10 tons at $1.50	$15.00	
Smelting charge, 10 x $6	60.00	
Smeltery deduction, 10% of $560	56.00	
Total charge	$131.00	
Gross value	560.00	
Net return	$429.00	

If the one ton of middling were combined with the 10 tons of concentrate there would result 11 tons of product containing 64.555% lead. The profit resulting from the treatment of this 11 tons of composite material is shown in the following table:

SMELTING 11 TONS OF LEAD CONCENTRATE CONTAINING 64.555% LEAD

Gross value, 7.1 tons metallic lead at $80		$568.00
Freight, 11 tons at $1.50	$16.50	
Smelting charge, 11 tons at $6.55	72.00	
Smeltery deduction, 10% of $568	56.80	
Total charge	$145.30	
Gross value	568.00	
Net return	$422.70	

The net return from smelting 11 tons of 64.555% lead concentrate is $422.70, whereas the return from smelting 10 tons of 70% concentrate is $429, thus showing a loss of $6.30, which is the amount incurred by the addition of the 10% middling. This proves that if a product cannot be shipped by itself at a profit, a profit will not be made if it is combined with a high-grade material; assuming, of course, that both products are smelted on the same smeltery basis.

The above example shows that, in an attempt to increase the metallurgical recovery, the profit per ton of ore milled would actually be decreased; but the object of concentration is to make money, and not to lose it. From the smeltery contract given above the net profit per ton, which will be received from shipping different grades of products, can be calculated. The figures given have been made on the assumption that lead is selling at 4c. a pound.

NET SMELTER RETURNS OF DIFFERENT GRADES OF LEAD PRODUCTS WITH 4-c. LEAD

Lead in Product, Per Cent.	Net Smeltery Return to the Shipper per Ton
70	$42.90
60	34.70
50	26.50
40	18.30
30	13.90
20	1.90
18	.26
17	(a) .56
16	(a) 1.38
10	(a) 6.34

(a) Loss.

It is evident, then, that there is a definite grade of product which, if shipped, will return neither profit nor loss to the shipper. The percentage of lead in this product I have termed the *point of disappearing returns*. This point can be solved by the following formula:

Let X = percentage of lead in product which returns neither profit nor loss to the shipper. Then by solving

$$(A)\ 0.8x - 1.5 - [6 + (70 - x)\ (.1)] - \frac{0.8x}{10} = 0,$$

it is found that x equals 17.68% lead. Consequently, no profit is returned by shipping a concentrate product which contains less than 17.68% lead; but,

instead of making a profit, a loss is incurred. This statement applies, of course, only under the assumption previously made. This point of disappearing returns will fluctuate with every variation in the price of lead, the cost of freight, and the detail of the smelting contract. A similar formula, however, can be derived for every contract, and, with this formula, plant managers will be in a position to determine the grade of material which will not return a profit. If the greatest profit is to be expected any concentrate containing less than the critical amount of lead should not be shipped.

That under the assumed smeltery contract noted above this point of disappearing returns is correct, is shown by the following calculations:

SMELTING ONE TON OF LEAD PRODUCT CONTAINING 17.68% LEAD

Gross value		$14.14
Freight	$1.50	
Smelting charge	11.25	
Smeltery deduction	1.41	
Total charge	$14.14	
Gross value	14.14	
Profit	$0.00	

The point of disappearing returns varies, of course, with the smelter contract as well as with all other cost variables; but, if a fixed contract be assumed, the point varies with the price of lead, decreasing with the increased price of lead, and *vice versa.*

It is possible to derive a general formula for determining the point of disappearing returns for any price of lead, thus:

GENERAL FORMULA FOR DETERMINING THE POINT OF DISAPPEARING RETURNS

$$(B)\quad 20Px - 1.5 - [6 + (70 - x)(0.1)] - \frac{20Px}{10} = 0$$

Where

P = price per lb. of metallic lead expressed in dollars.

x = per cent. lead in product.

The above formula can be simplified to read as follows:

$$(C)\quad 18Px + 0.1x = 14.5$$

The points of disappearing returns for different prices of lead are as follows:

POINTS OF DISAPPEARING RETURNS FOR VARIOUS PRICES OF LEAD

Price of Lead, Cents per Lb.	Assay of Product, Per Cent. Lead
2	31.5
3	22.7
4	17.7
5	14.5
6	12.3
7	10.7
8	9.4

Assuming that the mill product is shipped to a custom smeltery, these points of disappearing returns show when profits disappear. If the mill product be shipped to a smeltery operated by the same company, these points no longer hold true, but the principle remains effective and correct.

RE-TREATMENT OF CONCENTRATE

So far only one of the two points that affect the profits derived from shipping concentrate has been considered in the question of the elimination from the material shipped of that portion which will not return a profit. If this low-grade material is removed from the general mill concentrate by proper re-treatment methods, the material shipped would be of such a grade that every particle would show a profit to the shipper. However, there would be material in this re-treated concentrate that is only slightly richer than the standard shown in the critical assay. It would of course be profitable to ship this medium-grade material, but maximum profit is not obtained by so doing. Some portion of this concentrate should receive further treatment by being crushed and concentrated, and it would thus yield an increased profit. On the other hand, if a material of too high a grade be re-crushed, a loss would be incurred, as the increased grade of concentrate would be more than offset by the increased metallurgical loss. The function of the re-treating plant would be to separate from the concentrate that portion which will yield no profit if shipped, and also effect a like separation of all material which will yield an increased profit by further re-treatment. But the upper limits for this medium-grade product must be determined.

CRITICAL POINT FOR RE-CRUSHING

Before the second critical point can be ascertained, it is, of course, necessary to know the details of the smeltery contract and the results of preliminary tests made to learn what recovery is possible by treating the medium-grade product, and also to determine what grade of concentrate would be produced. If tests show that an extraction of 80% of the lead in the form of a 70% concentrate would result from the treatment of this intermediate-grade product, then the second point, which I will call the *critical point of middlings for re-crushing,* can be determined. By this I mean the point above which no material should be further re-concentrated. Material lying within the lower limit of the point of disappearing returns and the upper limit of the critical point for re-crushing should be further re-concentrated if the maximum economic recovery is to be obtained. This critical point for re-crushing can be determined mathematically and, of course, will vary according to costs, grade of concentrate, and other operating conditions.

For the smeltery contract assumed above, the formula has been determined for showing the critical point of middling for re-crushing:

FORMULA FOR DETERMINING CRITICAL POINT OF MIDDLING FOR RE-CRUSHING

$$(D)\quad 6.0 + 10.0\ (0.7 - x) + 1.5(x)\left(\tfrac{1}{10}\right)\ (P) - \frac{(0.8x)(1.5)}{0.7} - \frac{(0.8)(x)(6.0)}{0.7} - 0.8x\left(\tfrac{1}{10}\right)(P) - 0.5 - 0.2xP = 0$$

Where

x = Critical point of middling for re-crushing.

P = Price of metallic lead per ton expressed in dollars.

On the above basis it can be shown that with 4c. lead, the critical assay is 42.5%; with 5c. lead, 38.3%; with 6c. lead, 34.9%; with 7c. lead, 31.9%, and with 8c. lead, 29.8%.

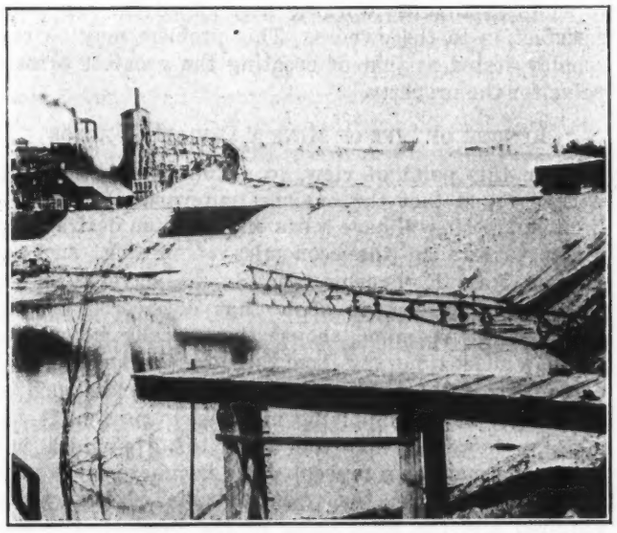
With a fixed price of lead the assay of the middling can be calculated, and material containing less than this amount of lead should be re-crushed to insure the greatest possible profit. If the general mill concentrate is treated on the tables before shipment, it is possible to estimate the two critical points discussed above; and the three different products can then be sent to the proper destinations.

Having discussed in a general way the economics of the case, and indicated how the critical points may be determined mathematically, it is pertinent to consider how the theoretical information can be put into prac-

tical use. One manner of making the division of the general mill concentrate is by means of a central re-treating plant; and, where possible, it is advisable to use tables instead of jigs, thus avoiding the abrasion which would be caused by the latter, and permitting an easy observation of the material being re-treated.

One reason for re-treatment is to check up the work of the mill man. This need becomes more and more necessary every day. Poor operation should not be permitted in any plant, but if this condition does exist—and it is getting more common every day—the only means of counteracting such inefficiency is to place a central re-treating plant under the charge of one man who will be directly responsible for the grade of concentrate shipped.

Another reason for re-treatment is to provide a high-grade product for the smeltery, which is specially equipped for the handling of high-grade lead concentrate only. A re-treatment plant eliminates the possibility of shipping any product that will not return a profit to the company; it permits the separation and



THE DAM AT MINE LA MOTTE, MISSOURI

re-treatment of any product that will show an increased profit by so doing. The operation of a re-treatment unit should result in an increased metallurgical extraction of the entire plant. At first it might seem that if the general mill concentrate were re-treated a certain loss would result. Although this assumption is correct, it must be remembered, on the other hand, that a re-treatment plant will permit the elimination from the original mill system of a great deal of abrasion on the jigs, and will also remove a troublesome middling product.

Re-treatment May Eliminate Excessive Jig Bed Abrasion

I have known cases where the re-treatment unit has increased the metallurgical extraction of the entire plant, for the above reasons. In many plants, in the attempt to obtain clean concentrates from the jigs, an enormous amount of abrasion is made on the jig bed. When one considers that the volume of a sphere is only 50% of the volume of a cube, both of unit measurement, it will be seen that the loss due to abrasion may be very serious. With a re-treating plant in operation, the concentrate can be discharged from the jig much sooner, and any free gangue removed on tables, thus eliminating this excess abrasion.

Furthermore, in many middling circuits there is frequently much free mineral, which is circulated for the simple reason that no provision exists for its elimination. By the use of a re-treatment plant, such middlings can be deprived of their free-metal content and a true middling then returned for re-grinding. A re-treatment plant makes the operation of the mill much more fool proof, and there is no occasion for expecting an increased metallurgical loss. If the concentrates being re-treated are, for any reason, so clean that no low-grade material can be removed from them, it is easy to ship all the different products from the re-treatment plant, which also serves as an excellent pilot mill and makes it possible to check the operation of any particular part of the main mill.

Re-treatment Not Always Applicable

In every case the economics of the problem must be worked out to determine if re-treatment is logical, because in some instances it is not advisable. No general rules may be laid down, any more than a general rule can be formulated for any part of ore concentration. The process to be followed in re-treatment of concentrate is simple; and in a properly designed installation the entire plant can be operated by one man. Wherever possible it is desirable to have a plant in the main mill, but the re-treatment plant should be installed as a complete separate unit, with its own individual power supply and accessory equipment.

It is not always advisable to send all the concentrate to the re-treatment plant, because in many cases it is possible to make a high-grade finished concentrate direct from some of the primary tables. The portion of concentrate to be re-treated is laundered to the main elevator of the re-treatment plant, elevated, and de-slimed. De-sliming can be effected either by the use of a cone or classifier. If the former is adopted, the spigot product is treated on Butchart concentrating tables, set to yield three products—a finished concentrate for shipping, an intermediate-grade product, and a low-grade product. The intermediate-grade product would be crushed in rolls and re-treated, yielding a concentrate for shipment, and a product to go back into the main mill circuit. The low-grade product from the tables would either go back into the main mill circuit or be ground in a ball or tube mill. The latter system may be advisable in some cases, as it definitely removes the middling which is so likely to build up in a mill circuit.

The overflow of the classifier is settled in tanks, the overflow of which can be sent to the flotation plant. The spigot product of the settling tanks is treated on Butchart tables, which yield (1) a high-grade concentrate for shipment, (2) a small amount of middling products which is circulated, and (3) a tailing, containing the fine free gangue, which is sent to the flotation plant. Such a plant can be operated by one man, who should be able to handle practically any tonnage of concentrate which may be made in the main mill.

According to a consular report, it was officially announced in Mexico that more than 400 mining properties would soon be returned to their owners in the State of Chihuahua. Properties belonging to the Creel, Terrazas, Pascual Orozco, and Victoriano Huerta interests, however, will continue to be retained by the government.

Nature and Uses of Capital in Mining

By J. R. FINLAY*

A monograph on the nature and uses of capital as applied, more particularly, to the mining industry. The writer, an authority on the subject, discusses the length of life of a mine, the essentials of a mining investment, and the factors affecting the return of capital invested. Comparisons between the cost of erecting a new plant and remodeling an old one are made, and pertinent conclusions drawn as to the fallibility of a priori calculations in this respect. Concrete examples are given to illustrate that industrial success is now more dependent on capital and effort than on bonanzas. The Excess-Profits Tax, government and private ownership, and other topics are discussed, and differentiation is proffered to distinguish between profits and capital. The paper, which will subsequently form a chapter in a revised edition of the author's treatise, "Cost of Mining," concludes with a review of the principles of the valuation of mining properties.

THE price at which mine products are sold is not determined wholly by the cost of extracting them, but frequently by the difficulty of discovering them. Once found, an orebody is a prize—that is, if it is rich enough—and its value is established even if it lies in parts of the world remote from the centers of industry. It is obviously no test of the highest efficiency merely to make such a mine pay. The real test is to secure from it the greatest value possible. This problem involves not only the skill of the explorer and the miner, but also some consideration of the use and purposes of capital in ways not primarily entirely obvious.

One of the first considerations of this nature is the plain fact that the promise of a dollar at some distant date is not as valuable as its immediate possession. This is just as true of incomes as of single payments. It requires little argument to convince a man that if he is to receive a total income of $10,000 he would be better off if he got it in 10 years than in 20; better off if he obtain it in 5 years than in 10; still better if he receive it in hand at once. As a matter of fact, if interest on money is worth 5% a year, his $10,000, if paid in installments covering 20 years, would be worth barely $6000 at present; if he could get it in 10 years, it would be worth $7500; in five years, $8500; only if paid immediately would it be worth the full $10,000. If the same ultimate return should be spread over an indefinitely long period, say 100 years, his annual income would be only $100; and his capital, that is, the value of his possession, would be only such a sum as $100 would be fair interest on—a paltry $2000.

Application to the Mining Industry

These are surely not considerations merely for the banker or the financier, but apply with equal or greater force to anyone to whom the possession of goods, the acquisition of food, clothing, and comforts is a matter of importance. It is but a short step to the conclusion that an indefinitely long continuance of income which can never total more than a certain amount is not a desirable objective, but is distinctly an objectionable one; so much so that it would be excellent business to spend money to remedy it. Such considerations have a wide application in the mining business. An orebody the discovery of which is valuable is invariably limited in extent. If it were not limited, either its discovery would not be valuable, or a single discovery would serve all future purposes, which would be the same thing. Therefore, the miner attacks his deposit fully convinced that it contains only a certain quantity of valuable product; that it is worth while for him to secure and enjoy this product as soon as possible, instead of waiting indefinitely for a slow dribble of output; and that his problem is to explore the mine intelligently, so as to equip it, that its working may afford the maximum satisfaction to the owners. This problem may be reasonably stated as that of creating the greatest *present value* for the property.

Length of Life of Mine a Variable Factor

From this point of view, to my mind a just one, it will be found that the business enterprise based on a limited deposit will have a life of maximum desirability. Many writers on the economics of mining, such as Hoover, Ross E. Browne, and Smyth, have given examples which seem to show that discovered ore, or even the entire mine, should theoretically be worked out in a short time, say from three to nine years. This, of course, if there are no exterior obstacles, such as the danger of oversupplying markets, to prevent it. It appears, however, that the length of life which will create the maximum present value is inherently a variable, depending on the relative value of the capital required and the total value of the product, the rate of annual profit earned on the capital used in constructing and operating the plant, and the time required to put the plant in operation. Where the annual return on the invested capital is high, the life should be short; but when that return diminishes toward an amount such as will be only interest on money, the inducement to invest further capital for the purpose of hurrying output diminishes until it finally disappears altogether. When the return on capital is a mere interest rate, the life of the enterprise must be indefinitely long to justify the investment at all. At this point, indeed, the argument for the investment of further capital would be the same as would induce investment in government bonds —merely that one might have it to invest; and the effort and risk involved in initiating and managing an enterprise would remain uncompensated. At this point, of course, there will be no inducement for continuing the enterprise, and it will cease.

The Essentials of a Mining Investment

For several reasons that will be developed presently, these considerations promise to have greater weight in the mining business of the United States, perhaps in the world at large, than they have had in the past; and it seems worth while to ponder and resolve them. As a foundation for the discussion, the general conditions

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of a mining investment may be noted. It naturally includes, as essential elements, opportunity, time, effort, and cash, the value of all of which can, of course, be expressed in money.

Omitting from the question of opportunity the matter of ownership, one may put down as a minimum the occurrence of ores in paying amounts. It is a point often overlooked that there is an essential difference between merely knowing that an orebody exists and having it so opened up that an output may be obtained from it.

The existence of many bodies of ore may be definitely established from mere geological observation or inference, or from drilling or some other form of exploration. This information is absolutely essential to the initiation of an industrial investment, and of course it must be paid for.

Delays and Extra Expense in Mine Planning Are Common

Once the decision to follow up these discoveries is made, considerable time is necessary for opening up and equipping the mine, the transportation system, mills and smelteries; in general terms, the required plant. In making and carrying out the plans for all this work there is abundant opportunity for mistakes, delays, and the deficiency of human comprehension and foresight. These are factors that are, generally, optimistically minimized. Why is it that a house planned to cost $3000, and let on contract at that price, when it is finished has cost $4500? Simply because neither the builder nor his contractor could think of everything that had to be done. When the contract is finished it is discovered that the house is not complete. This involves both parties in additional expense and in unexpected delay; for the builder will certainly not be satisfied with an unfinished house; it will be nothing short of a desolate disappointment. If the prospective house owner cannot afford to go on with it, he will have to confess it a failure. The next time he builds a house, of course, he will be on his guard against these contingencies that cannot possibly be foreseen. One does not know exactly what the "unforeseeable" will turn out to be, but he knows it is there.

Industrial Arts in State of Evolution

This homely comparison illustrates an element of every engineering project. It is particularly worth remembering that the industrial arts, including mining, have been for a long time, and still are, in a state of evolution. There is no standardized plan or pattern of plant, operation, or organization. Each new group of entrepreneurs may reasonably entertain hopes of improving upon their predecessors, in some respects at least; and in any event they invariably expect to make special adjustments for their own special conditions. Nothing is more common than to change plans after actual construction has begun, even on large-scale plants; indeed, sometimes the changes take the radical form of increasing the whole scale of operations, perhaps to take advantage of further developments of ore or to provide for working additional property. Thus though American engineering projects are generally carried out energetically and promptly, and on a large scale, it is entirely imaginary to consider them products of either invincible skill or of unerring judgment. They invariably cost more time and money than is foreseen, or for which plans have been made. The large group of Western mines known as the "porphyry coppers" is an excellent illustration of all these points. The time required to get a plant running from the moment of initiation was between three and seven years. The Inspiration Copper Co. is, of all, no doubt the greatest engineering success, but it is, at the same time, an example of all these causes of delay. Before it was finally launched as a going concern its properties were increased by various consolidations, its plants were designed for different outputs, and construction was interrupted to make a radical change in milling methods —from water concentration to oil flotation.

Modifications in Old Plants Involve Difficulties

Whatever may be said of starting a new plant may also be said of making radical additions to an old one; indeed, unless the original plant was especially designed in such manner as to facilitate additions, the difficulties are actually greater, for the operating plants are likely to get in the way of the additions and to compel the engineers of the enlarged plant to put up with a scheme that is sure to be, in some respects, antiquated and unsatisfactory.

It is, then, apparent that to change the scale of a mining operation is a matter requiring from three to seven years. It may be approximated at four years. Theoretically such a requirement seems unreasonable, but if one is to deal with the business as a practical matter of finance, it is far safer to count upon the actualities of experience than upon the calculations of theory. Of course all plants do not require the same amount of time. The small and often rude equipment needed for the shallow zinc mines of Southwest Missouri and Oklahoma may be built and started in a few months. But such plants are not only unrepresentative of the average conditions in the mining business, but are, after all, only incomplete installations.

The general tendency is toward elaboration of method and comprehensiveness of plan. If the operators in the Miami district consider their business in the aggregate, say as a matter of establishing an output of 100,000 tons of spelter a year, they will perceive that this is no problem of starting to dig ore from a 40-acre lease, but of exploring thousands of acres of land and of building smelteries and power plants. Such an operation would probably require the four years which, it appers, has been required to start the average Western copper mine. It may fairly be assumed that mines which may be quickly started, or quickly placed upon a new operating basis, are not really complete industrial units, but merely minor parts of a broader scheme already functioning. It might almost be said that they are not really mines, but *stopes*.

Estimates Based on Expenditures in Parallel Instances Preferable to a Priori Calculations

Here, then, an abrupt practical limitation to theoretical calculations of present values is encountered. If a mine could be worked out to advantage in three years after a plant is running, it is at least an embarrassment to have to wait four years before it can be started. Almost the same observations apply to the cost of plants as to the time required. *A priori* calculations are seldom adequate. The safest estimate will be the one based on the total expenditures that have been necessary for a similar plant.

It is easy to forget working capital altogether. The amount needed is usually equal to the cost of operating for between six months and a year. Thus, a company which expends $500,000 a month will need from $3,000,000 to $6,000,000 working capital. The Miami Copper Co. may be taken as an example. That company, in 1915, produced about 42,000,000 lb. of copper. Its capital accounts stood as follows:

CAPITAL ACCOUNT, MIAMI COPPER CO. 1915

Mine property	$1,535,000
Mine development	1,417,000
Construction	3,059,000
Working capital	3,000,000
Total	$9,011,000

If at that time it had been considered desirable to double this output from the same property, it might have been estimated that the scheme would not have been completed before 1919, and the capital account for an output of 84,000,000 lb. would have stood about as follows:

CAPITAL REQUIRED TO DOUBLE 1915 OUTPUT

Mine property	$1,535,000
Mine development	2,834,000
Construction	6,118,000
Working capital	6,000,000
Total capital required	$16,487,000

An increase of capital amounting to nearly $7,500,000 is indicated. In 1915 the normal earnings were about $2,250,000 a year, and, if the operations had been merely maintained on the same scale in the four years required for increasing the scale of operations, the company might have paid $9,000,000 to its stockholders; but if the enlargement were to be paid out of earnings, it could have paid only $1,500,000 to the stockholders. What length of life would be required to justify this course?

A Concrete Example

It is estimated that in 1915, with a life of thirteen years, the stock of the mine was worth $27 a share. It is plain that the increase would not benefit the stockholders unless it would increase the present value of the stock, that is, the value in 1915. Of course, such increase would have to be figured into it from the expectation of increased dividends to be obtained as the result of the project. It is easy to understand how this would work out from the standard calculations of the value of a series of installments of income.

The four installments of reduced income totaling $1,500,000 equal 50c. a share for four years. The expectation of these payments was worth, in 1915, $1.75 per share. In 1919, the company would go on a basis of $6 a share for four and a half years—at which time the mine would be exhausted. By doubling the output the life of the mine has not been shortened by one-half, but merely from thirteen years to eight and one-half years. This is the stumbling block to increasing value by increasing output: it must be paid for by delay in receiving earnings. In 1919 the value of $6 a share for four and one-half years would be about $23. But this was not the value of these installments in 1915. Nobody will pay $23 for $23 to be paid four years hence. One would lose money unless the sum was discounted by an amount which would constitute interest on payment for those four years. The actual value in 1915 would be about $19.16, to which would be added $1.75, the present value of the four minor installments; making a total value of $20.91. But the stock was worth on the former basis $27.

Many variations could be introduced into such computations. For instance, one might take into consideration the final liquidation of the working capital, which is an asset that would be worth less to the stock on the long-life basis than on the shortened-life basis. But to go into such niceties is a waste of time, in view of the already obvious fact that the increased scale of operations is not warranted, but would involve loss and wasted effort, and would be, in short, an engineering and financial blunder of the first magnitude. But there must be some volume of ore and some length of life that would justify doubling the output.

The conclusions set for this have been based on a total production of 18,000,000 tons, equivalent to thirteen years' life at 1,400,000 tons a year. The present value may be calculated on that basis, and on the doubled basis beginning in 1915, and assuming longer lives for both projects.

COMPARATIVE-PRODUCTION SCALE

Scale 1,400,000 Tons a Year			Scale 2,800,000 Tons a Year, With Four Years' Delay	
Tons	Life, Years	Value per Share	Life, Years	Value, 1915
21,000,000	15	$30.00	9½	$1.75 + $23.00 = $24.75
28,000,000	20	36.00	12	1.75 + 31.55 = 33.30
35,000,000	25	40.50	14½	1.75 + 38.75 = 40.50
42,000,000	30	44.20	17	1.75 + 45.00 = 46.75

Thus it will be perceived that not until the volume of ore is doubled will it pay to double the scale of operations. The inference is that the Miami mine was skillfully exploited in the first place.

These calculations must not be confused with other factors which might (and, as a matter of fact, do) enter into the situation. The output of the mine has actually been increased by one-half without a corresponding increase of plant cost, but merely through the instrumentality of minor alterations and adjustments. This fact does not enter into my argument, for the circumstance that such adjustments could be made means nothing more than that the capabilities of the plant had not been fully worked out and utilized.

Operating Plants at Part Capacity Not Economical

Any increase of output, without additional expense for construction, is pure gain. Anything short of running a plant at full capacity is uneconomical. The shortening of the life of a mine by such means (that is, without the use of additional capital) is so obviously advantageous that consideration of the arithmetical factors involved seems superfluous.

The real point of this discussion remains to be brought out. It will be noticed that the earning power of the capital invested in plant and working capital on the Miami ores is 30% per year. The minimum life required to return this capital with 5% interest is 3.8 years. It will not pay to double the scale of operations unless the life on this scale exceeds 25 years. At a smaller increase of capacity, say 25%, it is found that the present value will be increased slightly at a life of less than 25 years. It is plain that when the capital return is 30%, and the time required for initiating an enterprise is four years, the scale of operations to give the maximum value should be such as will give a life of between 20 and 25 years. A consideration of a variety of factors that might be introduced, such as the possibility of initiating plants in a shorter period than four years, would involve interminable arithmetic, and would probably be tiresome without adding materially to the clarity of the subject.

It is evident that the time required for plant installations is an important element in the problem of the intelligent use of capital, not only in mining but in industry in general; and that where the return on capital is high, and the warrantably assumed life of an enterprise is short, the possibility of loss through delay becomes proportionately greater. Thus, if the earnings upon capital are 100%, if it requires four years to start a plant, and if the capital required is in use an average of one-half the time required for its investment, it is plainly impossible to discover any promise of profit in an enterprise that will run less than two years after the plant is started. It is rare indeed that earnings will be so large, although there have been instances where they have been much greater.

Success of Industry Now Mainly Dependent on Capital and Effort

For example, the Goldfield Consolidated mining and milling plant probably cost about $2,000,000 in the aggregate and required two and one-half years for completion, but it immediately began to earn profits at the rate of $6,000,000 or $7,000,000 a year. A single year's operation would compensate for the investment, the time, and the effort. But such instances are merely spectacular accidents which are less and less likely to be repeated. The main tendency in the mining industry is toward less dependence upon the discovery of bonanzas and more dependence upon capital and sustained industrial effort.

The number of mining enterprises in this country that are rich enough to warrant an operating life of less than five years would probably constitute only a minute fraction of the industry, and one certainly not worth public attention. There are, of course, many mines in the country whose earnings on the capital invested are, say, from 25 to 50%, but the largest mining enterprises are already far below that figure. In the case of the United States Steel Corporation, the capital invested averaged before the war no less than $140 per ton of finished product sold each year, and the earnings only $8, or less than 6%. If money is worth 5% interest, the shortest justifiable life of such an investment is more than 40 years. If the earnings on capital are 10%, the shortest justifiable life will be 15 years.

High Returns Obtainable Only From Bonanza Deposits

It may be worth while to repeat, for the sake of emphasis, that the shortest justifiable life is that which will merely return the capital with such interest as might be obtained merely by lending the money on good security. When one comes to take account of the difficulty of guarding against chances of failure, such as lie in the overestimate of the ore supply, underestimate of cost, unfavorable changes in prices, or in absolute accidents, it seems venturesome to consider a return as low as 10% a safe margin for investment. To justify it, it is necessary to count on exterior factors, such as a probability that the business would continue to expand indefinitely instead of being limited to an exhaustible deposit. Perhaps I shall not be far astray if I assert that most mining enterprises are based upon a return of between 10 and 50% on the money required for development, plant, and working capital; that these returns vary according to the relative abundance of the materials handled, and that the higher returns are obtainable only upon bonanza deposits of which the mere discovery is a matter of capital importance.

These statements are likely to be misunderstood unless the basis for them is thoroughly explained. It is possible for one intent upon showing the extraordinary profits of a mine to take for an example some notable bonanza, and explain to the public that its great earnings come from practically nothing. This is often done for two diametrically opposite purposes. On the one hand, the stock promoter uses the figures to tempt speculation; on the other, theorists on social systems seize upon them as examples to illustrate the inequalities and injustice of the distribution of wealth which lie in "capitalism." Both representations may fairly be attributed to the fact that a little knowledge is often a dangerous thing.

The United Verde Extension Company

Take as an illustration the most remarkable mining bonanza of recent times, the United Verde Extension copper mine. This property was discovered by the present company at a cost of about $275,000. It immediately began shipping ore running more than 25% copper, and within three years under war prices it was earning at the rate of $12,000,000 a year. These facts sound exceedingly extravagant; but, when they are examined in terms of the normal conduct of business, modifications will be found at once.

In the first place, the expenditure of $275,000 was not really all the money put into this discovery. It was merely the amount required to put through the fortunate and decisive chapter of it, which was the reorganization and re-financing of an existing company. Exploration had previously been carried on for many years without success, and a large sum of money, I do not know how much, but certainly many hundred thousand dollars, was spent. This was not lost, because the work done pointed the way to ultimate success. Thus the actual cost of the discovery must have been nearly $1,000,000, instead of $275,000, as usually stated. Furthermore, the money spent by this company on this property was only a small part of the outlay on account of this particular bonanza; for, as soon as the discovery was made, other explorations were undertaken, right and left, in part by the very people interested in the Verde Extension; and millions were put in without resulting in the discovery of even a dollar's worth of ore. The real cost of the discovery, therefore, was not $275,000, but several millions. If it were a matter of importance, the exact amount could be determined with fair accuracy.

The next modification is that the apparent profits were for a time doubled by war prices. A further modification is that the sums stated as earnings have not been paid to the stockholders. Only a quarter of the amounts have been disbursed as dividends, and the stated earnings never will be so paid, for they have been expended in the construction of a plant, the development of the mine, for working capital, and for war taxes. If there had been no war prices, the earnings would have been, in 1916, 1917, and 1918, so much smaller that the dividends would have been certainly less than half of the $6,667,500 actually paid.

But the consideration that is really obscure to those who do not take the trouble to reason it out is the fact that the earnings that went to stockholders really came from borrowed capital. The new bonanza mine had no

equipment of its own to enable it to put copper on the market. Railroads had been built for other mines, by which smelteries, also built for other mines, could be reached. The owners of the United Verde Extension had to pay a toll out of the richest of its ores for the use of that capital; and it paid in the form of profit on freight and treatment. To ship those richest ores was only a fortunate and temporary expedient. The enterprise needed a plant of its own, in spite of all the assistance of this kind for which it could negotiate. The construction of a smeltery, a tunnel, and a railroad to connect it with the mine; of shafts, machinery, and living accommodations for employees (these being nothing short of two townsites, one at the mine, the other at the smeltery); the purchase of land, and the creation of a working capital have actually absorbed from $12,000,000 to $15,000,000. If the work had been done under pre-war conditions, these requirements would have been smaller by perhaps a third. But the mine cannot continue to ship the extraordinary ores that were obtained in these first years; and its earnings certainly will not average as much as 50% on the capital required to establish and operate it.

Industrial Success Often Achieved by Using Part of Prize as Capital

The individuals who accomplished the reorganization of this company reaped extraordinary profits. They drew a capital prize in the lottery of nature by paying for only one of the tickets. It is equally true that they used this prize with skill and acumen, and out of it built up an extensive industry by using a part of their prize as capital. The property is a first-rate example of adventure and success—the kind of enterprise that has been the spirit of the mining industry, keeping alive the desire for fresh efforts, and lending zest and even romance to the development of the country. There are elements in our national situation which make it worth while to inquire whether this sort of enterprise is to continue freely, or whether it is to be curtailed and discouraged. The importance of this question has been accentuated by the war, through the increase of taxation that is the invariable concomitant of wars.

There is no question that the mining industry should pay its full share to support the Government and every national enterprise in proportion to its income and profits. But it is exposed to the danger of confiscation of capital under the guise of "income" and "excess profits." The manner in which this may be done is evident from preceding discussion and examples. The revenue law of 1918 was passed when the wave of enhanced profits due to high war prices was rapidly receding. Costs were rising by leaps and bounds, and prices were either fixed or falling; profits were not much above normal and promised soon to become subnormal. The law carried a provision for taxing "excess profits" up to as much as 80%, and the question of the amount of profit was to be determined, not by the relation of the war earnings on an ounce of gold or a pound of copper to the normal earnings on an ounce of gold or a pound of copper, but by the nominal capital of the enterprise. For instance, there was acute danger that, according to this law, the capital of the United Verde Extension would be put down at 50c. a share, 10% allowed on this value for normal profits and the remainder taxed 80% as "excess profits." In the meantime, many persons had bought this stock at over $40 a share on an expectation of normal profits—that is, not counting upon war prices at all—and the actual profits were little, if any, above what might have been earned in ordinary times. According to the plan of the law, 80% of the earnings would be swept away. On these terms four-fifths of the capital of actual investors would be confiscated. Two questions may logically be considered: (1) What was the normal profit of the product of this industry, and (2) what was the capital in this industry.

Excess-Profits Tax

Before proceeding with the second point, it is reasonable to interject the conclusion that an excess-profits tax on real excess profits, as a war measure, is hardly open to objection. The United Verde Extension might, under average pre-war conditions, expect to make 10c. profit per pound of copper. Now, if it were making 20c. during the war, it would be not unreasonable to say that it was making 10c. "excess profits." A tax of 80% of that amount, even in addition to other ordinary income taxes, would not be confiscation. But the question would not necessarily be disposed of even at that point, for it would still be necessary to scrutinize the receipts and expenditures of all mines according to a uniform principle, in order to fix the amount of profit fairly. There would, however, be no objection to the theory if it could be applied properly.

It is hardly to be expected that the American nation will be influenced permanently by the psychology of a war period. There is no immediate prospect of more wars in the future than there have been in the past. This country has been engaged since the Revolution in wars of greater or less importance about 7% of the time, and its ordinary disposition is to dismiss the question of war as an abnormal and improbable contingency. Nevertheless, steps are taken during these occasional wars that have unexpected results in times of peace. A tariff to provide war revenue may be converted into "protection," a policy which may or may not favor some industries at the expense of other industries.

Government Administration of Public Utilities May Be Chrysalis of Government Ownership

A temporary stopping of brewing and distilling has been converted by war psychology into permanent and constitutional prohibition much sooner than would have been the case normally. Similarly, the marked increase of taxation on incomes, as a war measure, may develop, or degenerate, into a deliberate and sustained attack on capital. Government administration of railroads, as a temporary expedient, may be the chrysalis of government ownership. The net result may be to multiply the number of government employees, multiply the weight of the machinery of government, and to substitute for the independence of individual initiative a general dependence upon governmental employment. There are many who regard all these tendencies as desirable, who, indeed, look upon anything that can secure a majority of votes as not only desirable but sacred. It is hardly worth while to hold fixed opinions as to the merits of such tendencies. It is more to the point to discern, if possible, how powerful they are and what forces lie behind them. To make such an analysis is entirely beyond the scope of this discussion, but it seems as if I cannot be far wrong in drawing a general conclusion that the

mainspring of most of the tendencies of social, political, and economic legislation is faith in coöperative effort as against individual effort, and doubt as to whether this coöperative effort may properly be left to individual owners. The efficiency of great corporations has been demonstrated in many industries. Would not still greater corporations, even one all-embracing corporation, the government itself, be still more efficient? Would not such an institution automatically make all the people comfortable and relieve all of the terrors of making a living?

Private Ownership Still a Fundamental Law

But this conception is still only a theory, and will undoubtedly remain so. It is easy to comprehend how the coöperative or integrating movement will reach absolute limits, in the form of intricacies of detail which would be beyond the power of any corporation to master. When the tendency to integration is forced by its momentum beyond its proper boundary it is sure to be overcome by the reaction of disintegration.

The right of private ownership of property is still recognized by the fundamental law of the land. It is a natural desire of every man to have something of his own which he can alter, dispose of, or lend to suit his own whim. Whenever the theory of government interference goes far enough to deny the whims of a large enough number of people, it will meet effective resistance. Thus far it has been easy to draw some distinction between great aggregates of "capital," generally typified in the name of some individual whom magazine writers have made as mythical as Hercules or Theseus, and private property. No person with a spark of ambition or initiative wishes to deny himself the right of owning property and increasing it. The world is not ruled by the passive and timid, no matter how greatly they may preponderate in numbers. It is ruled by the aspiring and energetic.

Now, the mines of the country are not owned by a few rich and decadent beneficiaries of privilege, but by a huge army of stockholders, investors great and small, whose capital is, by overwhelming preponderance, the fruit of their own efforts and their own virtues—of frugality, industry, enterprise, and ability. These people have a decided interest in holding their capital intact, and not having it reduced or dissipated by ignorant—perhaps malicious—taxation of "income." This scheme of taxation is, apparently, in the minds of theorists, whose number is apparently increasing, a convenient way of meeting the increased expenses of the Government. These expenses are to be permanently increased not only by the interest on war debts, but by the growth of Government bureaus, which has been greatly stimulated by the war, and by a general expansion of the policy of the Government which it will be difficult, no doubt, to nullify.

Difficult To Differentiate Between Capital and Profits of Mines

What, then, is the capital of mines? There appears to be no sure way of fixing capital, or of distinguishing it sharply from profits. Some may be disposed to argue that capital is the actual amount of money invested in a given project. This conclusion does not seem to fit the case except momentarily. When an enterprise is launched the amount of money put into it is, of course, the amount upon which a return is expected; but it is always a mere accident if the return is just equal to the amount required. It is far more likely to be either below or above that amount. If below, a part of the investment is lost, because the enterprise does not yield an amount sufficient to return it to the owners. If above, a gain is made, because the yield is greater than the amount required to return the investment. In one case the capital diminishes; in the other it increases. In neither case does it remain stationary.

If an investment is disappointing, no amount of explanation will restore the capital; therefore everyone must admit that it involves a loss of capital. If it be argued that the capital in a successful enterprise does not increase, then one is forced to look forward tc the extinction of all capital, for it is self-evident that, if some enterprises lose capital and none gain it, the process of investment must be one of destruction.

Again, what is the amount invested? Must it be money drawn from a bank, or can it be some other form of value? Take, for instance, a mine. One party contributes $1,000,000 in actual money for equipment; another contributes a tract of land, on which, say, $10,000 has actually been spent, but which nevertheless is accepted by the first party at a valuation of $3,000,000. That the transaction is made in good faith is proved by the fact that the party which contributes all the money is satisfied with only one-third of the property. In this case, a frequent one, the question may be asked: Is the amount invested the $1,010,000 which may be traced to actual money transfers, or is it the $3,000,000 agreed upon as the basis of the property transfer? My assumption is that the investment is the latter sum. I would assume, further, that this sum is the capital put into the enterprise at the time the bargain is made, but that it is not necessarily a permanent measure of the capital, any more than the $10,000 in money, put into the land, was a final estimate of the value of the land.

Capital Must Have Value

This train of argument leads to the conclusion that if one is to admit the existence of capital at all, he can describe it only as so much "value." The origin of that value must be ignored, and attention devoted to the practical matter of how to measure it. I believe this conclusion is one which has been upheld, and will continue to be upheld, by the courts as well as by financiers. It seems utterly absurd to argue that capital can be limited by the mere process of setting down certain figures. It is equally out of the question to attach commercial significance to how much capital could be credited to an enterprise or to an individual at any past date. The fact that a rich man of today was a penniless boy 50 years ago has no bearing whatever on the amount of capital he may own. Similarly, a mine yielding $1,000,000 a year is surely an asset, and that asset is capital, without any regard to the fact that it may have been started by prospectors without a bank account, and by dint of manual labor.

Valuation of Mining Properties on Proper Basis

As to the process of establishing value, I have always argued that it must be traced to commercial transactions. It is not reasonable to attribute theoretical value, for instance, to the metal lead. Theoretical figures might perhaps be worked out for it, based, say, on its relative abundance compared with other metals, or on some such consideration; but nobody would pay any

attention to them. The value of lead is always established by its price in the open market. The value of a lead mine must rest on that price, and be figured from the amount that can be marketed, the cost of production, and the time required to complete the operation. If these additional factors (quantity, cost, and time) are uncertain, as they usually are, it is obvious that the valuation of the mine is a much more intricate and less reliable matter than that of the metal which it contains. As a matter of fact, grave mistakes are frequently made. Properties which are accepted by the public at high valuations finally turn out to be worthless.

The facts stated present a forceful argument for not accepting stock-market quotations as indicative of the value of mining companies, although it must be admitted that, in the majority of cases, those quotations do give a reasonable approximation of the values. But mines are not staples, as are the metals that they produce, and market quotations upon them are of a different order from quotations on staples. Thus, lead in a warehouse is always marketable. Its price varies between certain limits, of course, but the market value, whatever it is, is always there. But no such certitude or permanence is apparent about the stock of the mine. Today it may be in high favor; five years from now it may be worth twice as much, or nothing at all; and the quotations bear no definite relation to the price of the metal, but are influenced strongly, often decisively, by other factors.

Again, one can never be certain that the valuation of stocks by market quotation reflects in all cases their actual worth. Many properties are not on the market at all. Of those actually before the public, some may be in high esteem, skillfully advertised, and distributed among a large number of holders; others may be scarcely noticed, with few holders and few transfers; and the market may be merely nominal. It is conceivable that the highly advertised stock might bring twice the price of the obscure one, even though both have the same actual merit.

Question of Valuation of Mines Should Receive Frequent Review

I think these considerations are generally conceded to be convincing reasons for subjecting the valuation of mines to a searching and independent review every time such property becomes the object of an important transaction. I think the Government should recognize this fact in its dealings with mines. In former times those dealings were, from a financial point of view, of slight importance, but under present conditions the settlement of taxes is for prosperous concerns a transaction of the first order. It follows that it is highly desirable for the Government not only to permit but to encourage a rational method of valuation, which can be applied at any time at the instance of either party.

If the purpose of a government is not to promote fair play among its citizens, then it must be prepared to exercise its forces regardless of fair play. This does not sound well, for the consequent inference is that if the organized powers of a government are not necessarily to be used to secure justice, they may be used for oppression. An attitude of this kind, therefore, is tenable only as an excuse for temporary confusion, and not as a real policy. It follows as a practical conclusion that a government must adopt a logical and equitable theory of distinguishing capital from profit.

My conception of such a theory may be summarized as follows:

1. The capital is the present value that could be realized from the liquidation of an enterprise, through normal commercial transactions.

2. Profit is a fair interest upon the capital.

3. In the case of a property like a mine, in which a profit can be made only by using up its physical resources, income is never wholly profit. In the case of an unprofitable enterprise, the income is merely a partial return of money actually invested. In the case of a profitable enterprise, it is partly capital and partly a return on that capital.

When such a property is short lived, the proportion of capital required each year is large. As the length of life increases, the annual installment of capital diminishes. Thus a property which is to be liquidated in three annual installments requires an annual return of capital equal to more than 31% of the total value; whereas one that is to be liquidated in thirty annual installment requires only a return of 2%. Let it be supposed that, in each case, the income is $1000 and the interest rate 5%. In the three-year property, the present value is approximately $2790; the annual income is $930 principal and $70 interest or profit. In the case of the thirty-year property, the present value is $15,000, and the income is $250 principal and $750 profit. In the first instance the capital return required is 93% of the total income; in the second, only 25%. These figures are only approximate, but they illustrate the point.

From this it is clear that, as a matter of calculating income tax, the question of the proportion of profit is more a determination of expected life than of anything else. When the life is unlimited, the capital installment is zero, and all income is profit.

Rio Tinto Co., Ltd.

The annual report and statement of accounts of the Rio Tinto Co. for the year ending Dec. 31, 1918, shows that, during the year, the company, at the request of the British government, created peseta mortgage bonds in Spain for fifty million pesetas. The proceeds were placed at the disposal of the British government. The company's exchange operations benefited by this transaction, and its liability toward the Spanish bondholders is kept fully secured by a Treasury guarantee, together with the deposit at the company's bankers of sufficient British government securities.

The total distribution of dividends for the year amounted to £1,018,750. The interim and final payments on the ordinary shares are equal to a total dividend of 50% for the year. The total amounts paid in all the dividends, if spread over both classes of shares, would represent 29% on the whole share capital of the company.

During 1918, great difficulty was experienced in connection with company undertakings. For want of fuel, all the steam shovels and many of the locomotives were unable to work, the mining and other operations necessary for producing and shipping the pyrites needed by the British and foreign explosives factories being largely carried on by hand labor. Smelting operations were also affected, and could be carried out only on a reduced scale. Iron used in the precipitation of copper was so high in price that the cost of copper produced by the wet process was double that of normal times.

Cinnabar Ore in Jackson County, Oregon

By A. E. KELLOGG*

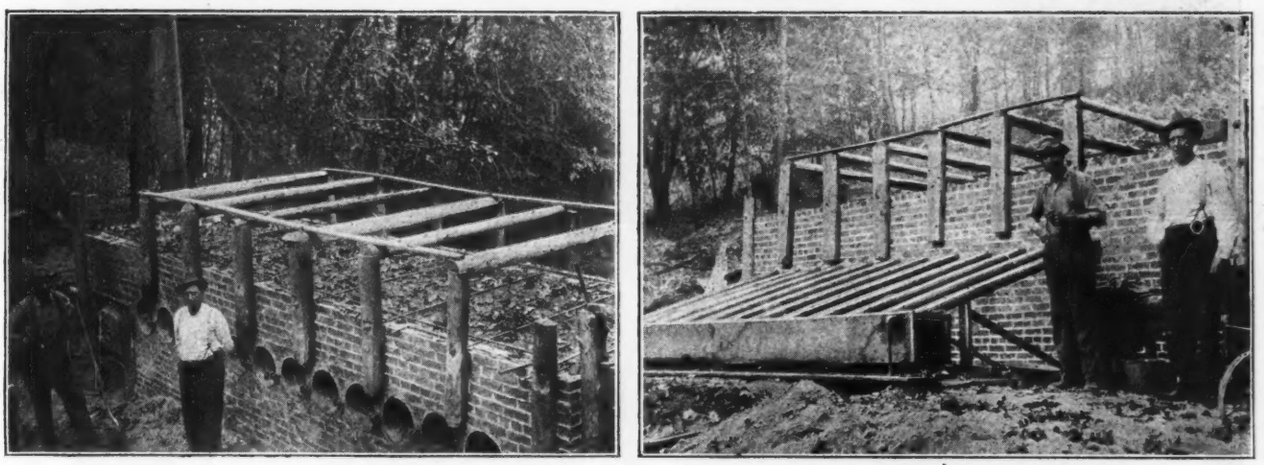
AN OFFICIAL examination of the cinnabar ore deposits in the Gold Hill district was made in 1913 by A. N. Winchell, in charge of the field work of the Oregon Bureau of Mines. H. M. Parks and A. M. Swartley, of the same bureau, made mention of these deposits in their 1916 "Hand Book of Oregon Mines," and are jointly responsible for the estimates and conclusions herein given.

Geologically, the Gold Hill district is an area chiefly occupied by old Paleozoic sediments interbedded with sills or flows of andesite and greenstone, the sedimentary rock striking northerly, usually about N. 15° E., and dipping eastward at angles ranging from 65° W. upward. Diller[1] has shown that Jurassic beds west of this district have been overturned so that the oldest strata now overlies the younger formations. It seems possible that the Paleozoic sediments are also overturned, and that the limestone found on Kanes Creek is probably of early Paleozoic age, and fossils found in limestone lenses on this creek indicate that they are not Devonian. Diller suggests that they are Silurian rather than Carboniferous in age. Accordingly, the Paleozoic sediments in this district are referred to as the Devonian or Carboniferous or to both periods.

Long after the formation of the sedimentary rocks, the region was intruded from below by a mass of molten igneous mass is now exposed to view in the mountains, by the same agency, the bedded rock solidified beneath a considerable thickness of sediments or other rocks, which have since been removed in some places. The igneous mass is now exposed to view in the mountains, and it seems probable that it underlies, at considerable depth, the major part of the Gold Hill district. This igneous intrusion and intense folding appear to have elevated the region sufficiently to cause a new cycle of erosion and the formation of coarse sediment which could not be transported far by ordinary agencies. Therefore conglomerates were produced, and these were succeeded by feldspathic sandstone during part of the Cretaceous period.

The history of quicksilver in this district dates from 1878, when an early settler discovered cinnabar ore in the meadows on Evans Creek 12 miles north of Gold Hill, on what is now known as the Chisholm group of mercury mines. Since that time and until recently the settlers distilled mercury from the ore taken from this deposit by roasting it in crude open furnaces, and supplied quicksilver to the gold-placer miners, who used it to save the fine gold in the sluice boxes.

The Chisholm mine is situated at an elevation of 2500 ft. on the south slope of the Umpaqua Mountains, in a heavily timbered district. The vein, which occurs along a graphite-sandstone contact where the granite is in part pegmatitic, and strikes N. 53° W., has been exposed by adits for 2000 ft., the greatest depth attained being 75 ft. The mineralized zone is from 100 to 200 ft. wide, and follows an irregular contact. The ore contains cinnabar, native quicksilver, pyrite, gold, zinc sulphide, silver, and a heavy black mineral resembling meta-cinnabarite. Samples taken from all of the adits assay from $5 to $6 per ton in gold, 5 oz. in silver, 2.5% zinc and 1% mercury. The cinnabar appears all through the ore and also in the hanging and foot walls in the form of seams and kidneys. These seams are from 6 to 20 in. thick and contain an average of from 17 to 70% mercury.



A FRONT AND REAR VIEW OF A TYPICAL 12-PIPE MERCURY FURNACE OPERATED IN THE OPEN IN THE CINNABAR-ORE DISTRICTS OF GOLD HILL, OREGON

This description, as to formation and contents, is equally applicable to the dike which extends northward from California into and through Jackson, Josephine, and Douglas counties, Oregon. This dike makes its first appearance in Oregon in the bedrock of the famous "49" placer diggings four miles northwest of Ashland. Other dikes, which have been considerably faulted, appear as laterals from the main dike through the country; on the west in the Applegate district extending into Josephine County and on the east into the Butte Creek district. The main vein or dike makes its next appearance north in the meadows, where the Chisholm mine is situated, and thence extends over the Umpaqua Mountains into Douglas County, where the rich cinnabar deposits are still in evidence.

*Box 173, Gold Hill, Oregon.

[1]U. S. Geological Survey *Bull.* 546, pp. 18 and 22.

Every Victory Note is a **Monument** to the heroes who sleep in France. **Buy to the limit.**

FIG. 1. TANK ROOM. FIG. 2. TRUCK FOR TRANSFER RING THE ANODES. FIG. 3. METHOD OF REMOVING DEPOSITED SILVER. FIG. 4. SUSPENSION OF CATHODES

The Electrolytic Refining of Silver and Gold*

By GEORGE G. GRISWOLD†

An account of refining silver bullion electrolytically, by the Moebius process, at the works of the American Smelting and Refining Co., at Perth Amboy, N. J., The Wohlwill plant for electrolytically refining the gold bullion, and recovering from it platinum and palladium, is also described. The explanatory illustrations that accompany this article are on the opposite and succeeding pages.

THE first electrolytic plant for the treatment of doré bullion was put in by the Kansas City Smelting and Refining Co., Argentine, Kan., in 1884 or 1885, by Dr. Moebius. This worked satisfactorily, and was followed by other installations. The second plant was at the Perth Amboy works of the American Smelting and Refining Co., and was of the Moebius vertical type. Dr. Moebius afterward patented a horizontal system with traveling silver belts for cathodes, a small installation of which was made at Perth Amboy, but it did not prove as satisfactory as the vertical type. When the parting plant was destroyed by fire, in 1897, it was decided to install the vertical system in the new plant. The decision to adopt this system was due to its greater capacity for a given floor space, smaller tie-up, and the fact that, being run in connection with a lead refinery, the anodes could be cheaply made 990 fine or better.

The new tank room contains 24 sections of 6 tanks each, the sections being in series and the tanks in multiple. In the original installation the tanks were made of wood, which was never satisfactory, and, consequently, stoneware tanks were used in the new plant. The anodes, weighing about 100 oz., are cast by hand in the lead refinery, and transferred in locked steel boxes, by a storage-battery truck, to the parting plant. They are weighed, counted, and punched, and are then used as required. The punching gives a slight depression on each side of the ear of the anode, thus furnishing a secure hold and better contact for the spring clips which support them.

The Cathodes

The cathodes are made from cold-rolled silver sheets $\frac{1}{32}$ in. thick. There are four bags and five cathodes in each tank, and each bag holds four new anodes. Seventy-five percent of the silver is deposited in 24 hours. It is constantly brushed from the cathodes by wooden sticks, rigidly attached to a wooden frame having a reciprocating motion, which serve to prevent short circuiting, and also to give circulation. The deposited silver falls into wooden silver boxes, and is removed daily by dropping the hinged bottom of the silver boxes, which dumps the silver into a tray, from which it is emptied into a wooden silver car, provided with a false bottom and filter. The car is transferred to vacuum boxes, and the silver is washed and then transferred to the melting room, where it is dried, melted, and cast into bars.

The electrolyte is a neutral nitrate solution containing 15 to 20 gm. silver and 30 to 40 gm. copper per liter. Silver nitrate is added as required, and enough electrolyte withdrawn daily to keep the purity up to standard. The waste electrolyte is put in a wooden tank and the silver precipitated on copper, after which the copper is cemented out on iron, and the resultant solution, after passing over lime, thrown away.

Current was supplied by an engine-driven generator in the same building, and a current density of 19½ amperes per sq.ft. carefully maintained; but later it was found more advantageous to install a motor-generator set in the central power plant, and to increase the current density to 40 amperes per sq.ft., which increased the capacity accordingly. The current is carried from the switchboard by copper cables which distribute it through mercury-filled copper cups over ¾-in. cold-rolled copper busbars, the end ones being bent to fit into the mercury cup when lowered into position.

Bags for Catching Gold Slime

The bags which contain the gold slime are removed at regular intervals, and the contents sluiced into the gold box, thoroughly washed, transferred to iron boiling kettles, and treated with H_2SO_4, 66° Bé. to remove the copper and silver. The gold slime is washed, dried and cast into anodes for electrolytic refining by the Wohlwill process. The liquor from boiling the slimes is run into lead-lined tanks, and the silver precipitated out on copper. The copper-bearing solution then goes to the copper refinery.

The Wohlwill installation has five cells, and is in series with the silver sections. At the time it was put in, owing to the war, it was not possible to obtain porcelain, and stoneware cells were used. With the high current density of 150 amperes per sq.ft. osmosis develops in the stoneware; also, as it cracks with any unequal strain, it was necessary to place the cells in a lead-lined box filled with water heated by steam coils. The boxes are supported in a lead-covered table with cupped top.

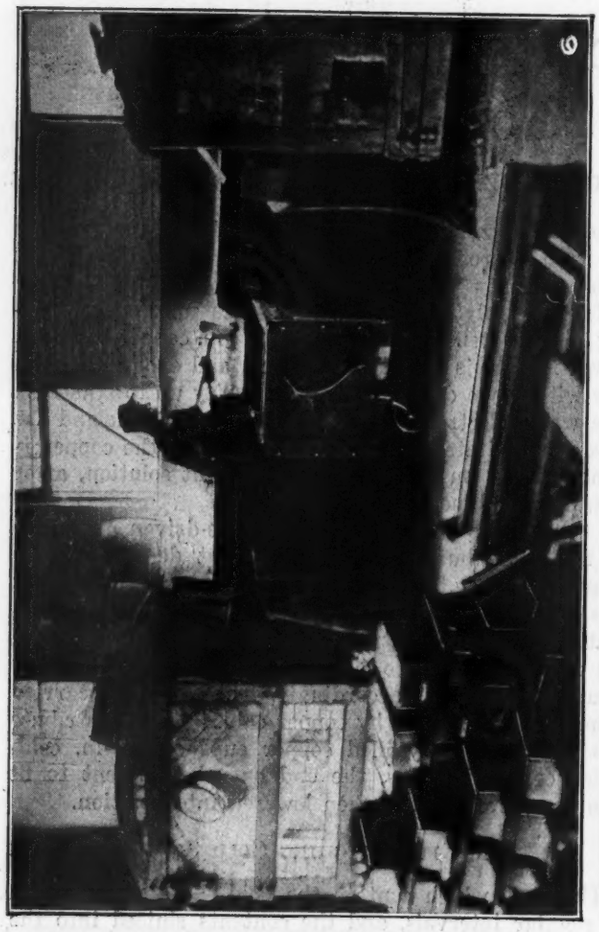
Mercury Cups on Busbars Make Quick Changes Easily Effected

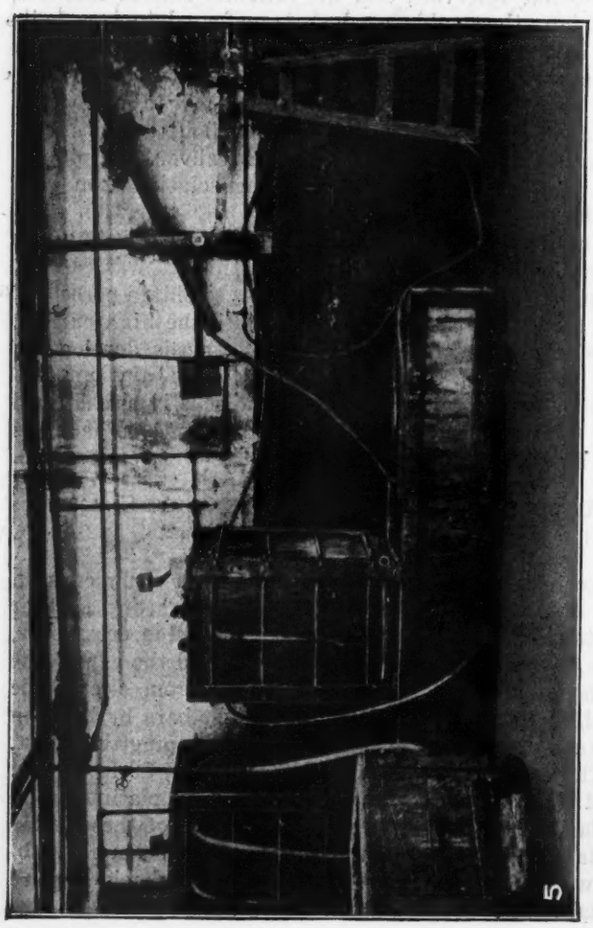
An interesting feature is the use of mercury cups on the ends of the copper busbars, whereby any unit or units can be cut in or out quickly by using cross bars, also of copper, with ends bent to fit into the cups. The cathodes are thin gold sheets, rolled from electrolytic gold, and are connected to the contact bars by bending one end of the sheet around them and clipping them fast.

The electrolyte contains 30% free HCl, 80 to 85 gm. gold per liter, and varying amounts of platinum and palladium. When a sufficient percentage of these latter metals accumulates in the solution, a portion is withdrawn, and they are separated, refined, and sold as pure metals.

*A paper which was presented at the New York meeting of the American Electrochemical Society, Apr. 3-5, 1919.

†Superintendent, smelting and lead refinery, American Smelting and Refining Co., Maurer, New Jersey.





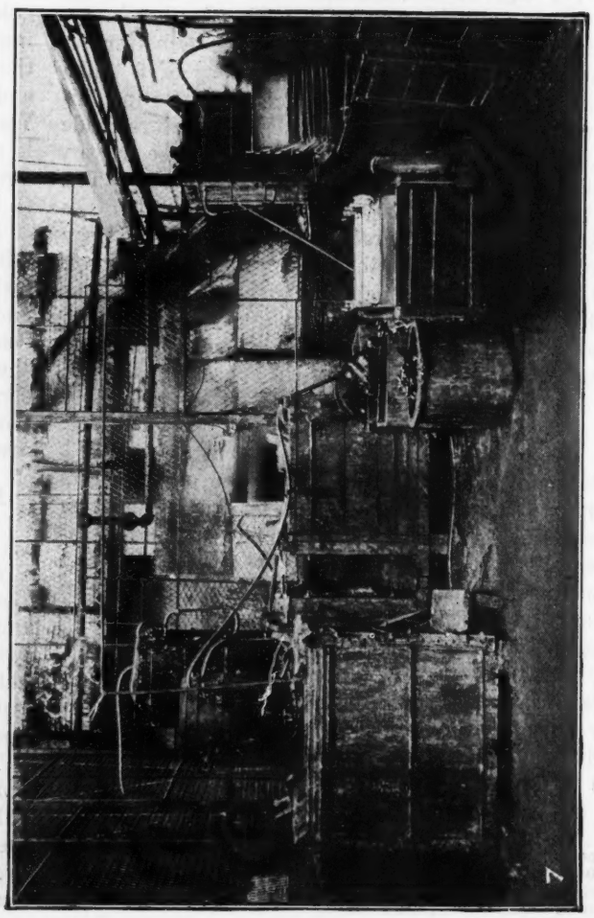


FIG. 5. VACUUM BOXES, SUMP TANK, AND SOLUTION PUMP. FIG. 6. MELTING FURNACES. FIG. 7. GOLD BOX AND BOILING KETTLES
FIG. 8. WOHLWILL GOLD-REFINING INSTALLATION

Iron-Ore Super-Taxation in Minnesota*

By DWIGHT E. WOODBRIDGE†

The tax situation in the northern Minnesota iron districts has for several years been a precarious one, and subject to much bitter controversy in the State Legislature. It has been shown during each argument of the matter that increasing operating costs have reduced the miner's margin of profit, and that to increase his tax burden, already greater than that levied in other states where iron mining is carried on, will result in the suspension of that industry. In the following article it is shown that Minnesota, although producing 62% of the iron ore mined in North America, is in a keen competitive position with regard to other iron-mining districts of the world.

WE READ of the Mesabi Range and its share of the iron production of the United States. We know, for instance, that 62% of the iron ore mined in North America last year was mined in Minnesota; we know what enormous sums the iron mines pay in tolls to the state and in wages to labor, and what further vast sums the mines contribute in the form of Federal taxes, and incidentally in gross earnings taxes, and in almost every other form of tax imposition. Quite naturally we get the idea that there is nothing like the Mesabi Range; that there are no other districts to compete with it. But in this we are wrong. France alone has recovered from Germany in the last few months as much ore as there is in Minnesota.

Prominence of Minnesota Iron Deposits Due to Economic Conditions

Minnesota owes its preëminence in iron ore not only to the size and comparative ease of mining of its merchantable deposits, but also to the highway of the Great Lakes, to the development of automatic machinery, to the marvelous improvement in costs brought about by big railways, big ships and big operations generally, and, perhaps most of all, to the fact that many years ago, before the state was known to contain ore at all, a conjunction of markets, waterways, coal fields and iron ore made western Pennsylvania and eastern Ohio the great producers of articles made from iron. It was this conjunction of waterways, markets, and coal fields that led to the beginning of the Pittsburgh district as a producer of finished iron articles years before pig iron was made there.

The construction of the first blast furnace in Pittsburgh, in 1869, marked the drift of the markets from the Atlantic Coast to the interior, and it is to this incident that we owe the preëminence of Minnesota in iron ore. If the blast furnaces of this country were still situated east of the Alleghanies, in New York State, in Pennsylvania, in Maryland, as they once were, there would be no question of an iron-ore tonnage tax in Minnesota, for there would not be enough iron ore mined here to make it worth while, and our mines would supply the ore for only a few local and scattered furnaces. So long as 65 years ago there were in Maryland alone no fewer than 31 blast furnaces, and the Atlantic Coast states from Massachusetts to Georgia were dotted with them. But the Pittsburgh district was a better distributing center for the great new markets of what was then the West. Iron articles were fabricated there, and finally it became the world's greatest steel-making center.

Under present conditions it is cheaper to bring ore to Pittsburgh from the Great Lakes than from the Atlantic, and this is the secret of the development of Minnesota. I use the word Pittsburgh as typifying all that tremendous manufacturing region from Lake Erie to the Alleghanies; for railway rates are so fixed that all this region, the Lake Erie shore, the Mahoning and Shenango valleys, Youngstown, Wheeling and Pittsburgh, is on a parity.

A project is now under way for the construction of great steel mills on New York Bay. As I understand it, this project simply waits action by the Federal Government permitting of the filling of the Jersey flats near Newark. Ores for such a plant as it is designed to erect there will come from Cuba, from Brazil, from Newfoundland, from the states of New York and New Jersey themselves; from Spain, perhaps from Sweden and Norway. They are unlikely to come from the interior of the United States, and cannot, unless we are on a strictly competitive basis. This plant and others like it will be direct competitors of steel mills which secure their ore from Minnesota. With the building of such a fleet of American merchant ships as is planned, ocean freights will eventually be so low that bulk freight like iron ore will be carried at a small cost.

Nine Well-Known Districts Contain World's Largest Iron-Ore Deposits

There are eight or nine well-known iron-ore districts in the world. These are, in their order of size: Brazil; Newfoundland; Eastern France, Lorraine, and Luxembourg; Lake Superior; northern Sweden; eastern Cuba; Alabama and Georgia; eastern New York and New Jersey, and perhaps a ninth in Norwegian Lapland, north from the Arctic Circle around to the White Sea. All of these are competitive, one with another, in so far as the world's trade is concerned as to anything more than mere local and provincial business.

Economic Equalization of Various Districts

It is a curious but none the less indisputable fact that Nature seems to have equalized the advantages and disadvantages of most of these great districts, so that almost every one of them, whether it contain high-grade ore or low, whether it is separated from markets by long distances or by short, or whether it is on all-water transportation or on rail, can compete on fairly even terms with each of the others, at naturally competitive points. This equality is so close that any added burden, however slight, put on one field, may be too much for it to overcome. For example, the ores of the Lake Superior field, more especially that portion of it represented by the Mesabi Range, are easily mined, have cheap transportation, but are at long distances from the

*Abstract of a statement made to the Tax Committee of the House of Representatives, Minnesota Legislature, on Feb. 24, 1919, in connection with bills then before the Legislature providing for super-taxes on the profits of mining companies in the state.

†Consulting mining engineer, Sellwood Bldg., Duluth, Minnesota.

ocean, and are of medium quality, whereas the ores of Brazil, 300 miles from the sea and 5000 miles by ocean to coal fields, are of exceptionally high grade, and mining there is mere quarrying.

Cuban ores lie on the very beaches of the Atlantic and are on the surface, but they are lean and wet and require concentration to make them available The Norwegian deposits, situated long distances away and so low in grade that they too must be concentrated, are beside great water-powers which can be developed at low cost and will supply the necessary power for beneficiation treatment. The one striking exception to this general similarity of assemblage costs are the iron ores in Newfoundland. This deposit, twice as large as all those of Lake Superior combined and of as high a grade so far as blast-furnace results are concerned, lies partly under the Atlantic Ocean, and its ores can be mined and delivered at such ports as Philadelphia, New York, Liverpool, or Hamburg at from $2.25 to $2.50 a ton, or, say, 5c. per unit of iron. I am using in all of these figures not war-time costs, but those of a normal period, both as to mining and transportation. This Newfoundland deposit outcrops on the edge of the sea and covers an area of 25 to 30 square miles under the Atlantic. It is estimated by engineers that it contains about 3½ billion tons of ore now merchantable. It is cheaply mined, because no timbering is required and because the deposit is without any mixture of rock and is homogeneous.

The ores of Cuba are distant from New York only by 1100 miles of cheap water transportation. They lie on the sea and are adjacent to harbors, and they are the soil itself, so that no expensive stripping, no high preliminary costs, no long railways, are necessary to enable them to enter the market. Cuban ores can be delivered at American Atlantic ports at not far from 7c. per unit.

Brazil Deposits Lack Development

In Brazil are the greatest high-grade deposits known to the world, and estimates indicate not less than five billion tons. Before the war, plans were far advanced for the development of these ores and their delivery to England and the United States, and we learn that now these plans are being revived and that in a short time mines will be opening and these ores will enter the market. Because of their exceedingly high and other desirable attributes, and their lack of phosphorus, they must be counted on to attain and hold their deservedly important place.

The ores of Spain come to this country in comparatively small quantities, but it is a fact that during 1918, even with the high charge for ocean freights and with the great demand for shipping for war purposes, more than 100,000 tons of Spanish ore was sold for delivery at Philadelphia.

Sweden has one deposit of one billion tons, and there is as much ore in northern Sweden as there is in northern Minnesota, and the grade averages better. These ores, though they do not reach this country now, have done so in the past and will do so in the future if our costs here are higher than their own.

The coast of Norway from the Arctic Circle to the Russian frontier near the White Sea, a distance of about 700 miles, is one continuous belt of iron-bearing country. Two vast deposits of ore are known to exist in the district, although undoubtedly there are many more. They are situated close to the sea and near water-powers. They can be mined and concentrated cheaply, and normal ocean freights are low. I have known the time when, for from $2.50 to $5 a ton, depending on the bulkiness of the materials, ships would carry cargoes half around the world. Such low rates, or lower, will undoubtedly return. The Norwegians have sold their high-grade concentrate, delivered in this country, at about 10c. a unit, or $6.50 a ton, in which presumably there was a profit.

High-Grade Magnetic Deposits in New York

New York and New Jersey contain in their magnetic ore deposits about two billion tons, and New York in its hematite deposits has about five hundred million tons more. The magnetic iron deposits in New York have already produced about forty million tons of high-grade ore, part of it the richest ever mined anywhere. There was completed last year a barge canal connecting these deposits with New York City, and boats have been built for the ore traffic. It is expected that by the use of these boats ore will be delivered in New York Harbor at about 5c. a unit. Steel barges are to be built to carry New York ore through Buffalo and the Great Lakes into territory served by Lake Superior ores, and it is stated that these ores will compete successfully there.

Alabama Deposits Ideally Situated for Furnace Conditions

There are more than one billion tons of red iron ores alone in Alabama which were being mined a few years ago at about 90c. a ton, and there are no heavy costs for freight to furnaces. The furnaces are immediately adjacent. I know of one company which controls a strip of land one mile wide and four miles long. At one end of this strip are its iron mines; at the other end its coal fields; in the center its furnaces and steel mills rising out of limestone beds of a sort available for furnace use; and connecting the three is a double-track standard-gage railway which crosses in its four miles of length ten trunk roads. Nowhere in the world are conditions so favorable for the assemblage of materials required in the manufacture of pig iron. Nowhere in the world, unless it be in India and China with labor at a few cents a day, can pig iron be made so cheaply as by this company. This and other concerns in the same district are so situated with regard to ocean transportation that they can deliver and have delivered to Europe at the lowest costs. The influence of the Panama Canal must eventually raise at some point on the Gulf of Mexico, say at Mobile or Pensacola, one of the great centers of iron manufacture and export.

Michigan is having a tremendous expansion, and the ore beds of that state, though not exposed to the surface, as are some of those of Minnesota, may be as extensive and productive. As nearly as I can learn, taxes upon mines in Michigan are much less than they are in Minnesota at the present time. Figures given me by the county auditors of the three iron counties of Michigan show that taxes paid by mining companies there in 1918 varied from 1.5c. per ton on their output to as high as 15c., averaging about 8c. In 1918 the Steel Corporation paid about 28c. a ton on its production in Minnesota, and this year it must pay even more.

I do not think the Steel Corporation will be so seriously affected by additional tax burdens as will be the individual operator, the local Minnesota man who is

developing small properties and who has put his own money into the mining game. These operators will be handicapped by additional taxation to such an extent that some of them must go out of business. If you wish to aid the collection into a few hands of the iron ores of Minnesota and if you wish to further the possibility of monopolistic ownership, you can do it more easily and quickly by passing tonnage-tax bills than in any other way, for you will force the small operator to abandon his properties, and no one can afford to work them who has not the advantage of being linked up with blast furnaces or steel mills.

I know of half a dozen drilling campaigns under way now in Wisconsin and Michigan, in a search for ore, in which an aggregate of more than a million dollars is being spent. I know of one large company in New York that is arranging to drill six miles of holes in its ore beds preparatory to extension of its mining operation. I do not know of one drill working in Minnesota in a search for orebodies.

COMPARATIVE COSTS OF MINING AND TRANSPORTATION OF IRON ORE

Situation of District	Tonnage	Average Per Cent. Iron Content	Assumed Cost of Mining (*a*)	Freights To Atlantic Coast	Freights To Valley Points (*b*)	Cost to Furnace per Unit of Iron: Atlantic Coast	Cost to Furnace per Unit of Iron: Valley Points
Brazil	5,000,000,000	68	$1.00	$4.00	$5.60	7.3c.	9.7c.
Newfoundland	3,500,000,000	50	1.25	1.25	2.85	5.0	8.2
Lake Superior	2,750,000,000	52	3.15	2.85	1.70	11.5	9.3
Sweden	2,200,000,000	57	2.00	2.00	3.60	7.1	9.5
Northern Cuba	3,000,000,000(*c*)	36	2.00	.90	2.50	5.8	9.0
New York and New Jersey	2,500,000,000(*c*)	35	2.50	1.00	2.60	6.1	8.9
Alabama	1,750,000,000(*d*)	36	1.00	.25	2.75	3.5	10.5
Norway	500,000,000(*c*)	35	2.50	2.00	3.60	7.5	10.2

(*a*) Figures are in part necessarily assumed, as in Brazil. For Newfoundland they are based on results. For Lake Superior the $3.15 average is because 50% of Lake ore has averaged $2.90 in cost at Lake Erie for the last six years, and knowing that this 50% has lesser royalties and greater steam-shovel proportion than on the remainder, it is assumed that the remainder costs 50c. more per ton, giving the $3.15 average.

(*b*) Freights and dock charges to Valley points from seaboard are assumed at $1.60. There is no rate, but the assumption is based on a set of about 25 rail rates covering iron-ore movement in the United States.

(*c*) The cost of ore to furnace is figured not against crude analyses but against an average iron content in concentrate produced.

(*d*) Alabama ores are smelted at the furnaces, and the figure of 25c. in column of "Freights to Atlantic Coast" is merely the switching and delivery charge from mine to furnace. To this should be added freight on product to the sea, to complete this comparison.

All the figures in the comparative-cost table are based on fairly normal conditions, both as to freights and mining costs, and are not to be considered as representing present conditions, except for tonnages and grades. It is exceedingly difficult to give a figure on freights from Brazil, as no iron ore has yet been shipped from that country. The figures given for other points represent perhaps sub-normal conditions in the ocean-tonnage markets, but they are based on conditions that are likely to return in the course of a few years.

The figures of tonnage and unit costs are based on the following, as well as other data: Brazil—British Department of Industrial Research; reports of the U. S. Geological Survey's officials; paper in the Transactions of the American Institute of Mining Engineers. Newfoundland—"Memoir 78," Canadian Department of Mines, page 7; the writer's personal estimates; E. C. Eckel, "Iron Ores of the World," p. 304; C. K. Leith, of U. S. Geological Survey. Lake Superior—U. S. Geological Survey, "Monograph No. 52," C. W. Hayes, Chief Geologist. Sweden—"Iron Ore Resources of the World," published by the International Geological Congress. Northern Cuba—Proceedings of American Institute of Mining Engineers, Vol. 42, pp. 73 to 169. New York and New Jersey—Proceedings of American Iron and Steel Institute for October, 1916; G. C. Foote, manager for Witherbee, Sherman & Co. in Transactions of American Institute of Mining Engineers, Vol. 56, p. 912; "Report of State Geologist of New Jersey for 1910," F. C. Nason, late State Geologist; various papers. Alabama—"Mineral Resources of the United States for 1906," Proceedings American Institute of Mining Engineers, Vol. 43, p. 291; U. S. Geological Survey, "Bulletin 400." Norway—"Iron Ore Resources of the World," issued by the International Geological Congress; the writer's own investigations; also reports of the Actieskelskabet Sydvaranger. The sources noted include but a few of the possible references confirmatory to what have been given above as the tonnages and other detail of competitive iron ores of the world, and touch on only the main groups of deposits.

The iron-ore people remember steadily that they are struggling against the imposition of a principle of taxation false in theory and vicious in practice, and they know that any tonnage-tax bill, however gentle and mild it may seem, is but the entering wedge for a constantly growing series of tax bills, each one worse than that before, which they can see following each other down the vista of the coming years.

There has been a good deal of loose talk with regard to the Steel Corporation, but that corporation is as truly an evolution and as logical as that of a national state growing from a community of farms and villages and cities. And for this reason: For all the period of our national growth until long after the Civil War, blast furnaces and rolling mills and iron mines and transportation interests were separated, and though their owners saw the advantage of combination, they were unable to consolidate, because of a lack of liquid capital. Their own demands, caused by their rapid growth, changed their liquid capital into fixed form so rapidly and to such an extent that to carry on their businesses they were obliged to borrow in large amounts, and they could borrow only on paper passed from one to another and indorsed. They could not have borrowed the money they needed had the different interests been combined into one company, for there could have been no indorsements by separate entities. But later their profits permitted the growth of fluid capital again, and their borrowing requirements were less, and they began to combine, and mines and mills and railways and ships formed the great aggregation of today. This is in brief the history of the growth of the Carnegie Steel Co. and of the United States Steel Corporation.

Predictions for Iron Development in Minnesota

Two years ago I appeared before you to urge that the Legislature do not pass a tonnage-tax bill, for I was helping to carry out a great experiment—an experiment that meant adding hundreds of millions of tons of iron ore to the resources of Minnesota; an experiment that, if successful, would virtually create iron ore out of waste rock. I said to you then that if the experiment succeeded it would make iron mining in the state perpetual, so far as anything in this transitory world can be said to be perpetual, and that we should do away with Mr. Bendixon's argument of a "vanishing heritage" in ore. I said that the margin of profit in the business would doubtless be close and I urged that you place no handicap upon us. Since that time a large sum of money—several hundred thousand dollars in fact—has been spent in the attempt to demonstrate our theory, and we are confident of success; so much so that we are now making plans for the construction of works that will cost several million dollars, to prove finally that all these billions of tons of waste rock are of value and will be the basis of an industry that ultimately will pay billions to labor in Minnesota from our own operations and from those of others who may follow us in time. The tonnage that this experiment adds to the resources of our state is far greater than I dared think two years ago, large as that was.

In the following table the gross returns on non-bessemer ore are rated on an analysis of 51.5% iron and 10% moisture. Rates apply after paying rail and Lake freight and selling charges, to get the ore to Lake Erie, where the base price applies. Actual shipments of Mesabi non-bessemer ore run about 1.5% under the base grade, and the price received will therefore be from 15c. to 20c. under the figure given in the price column.

Out of the "gross return to mine" come all mine costs, the amortization, all taxes, overload, development, unsuccessful exploration, insurance, shrinkage in transit, and the loss resulting from contract sales made at prices

GROSS RETURN TO THE MINE ON MESABI NON-BESSEMER BASE STANDARD ORE

Year	Mesabi Non-Bessemer Price	Rail Freight to Lake Superior	Lake Freight and Selling	Total Charges	Gross Return to Mine
1901	$2.75	$0.80	$0.95	$1.75	$1.00
1902	2.75	.80	.85	1.65	1.10
1903	3.20	.80	.95	1.75	1.45
1904	2.50	.80	.80	1.60	.90
1905	3.00	.80	.85	1.65	1.35
1906	3.50	.80	.85	1.65	1.85
1907	4.00	.80	.85	1.65	2.35
1908	3.50	.80	.75	1.55	1.95
1909	3.50	.80	.75	1.55	1.95
1910	4.00	.80	.80	1.60	2.40
1911	3.50	.80	.70	1.50	2.00
1912	2.85	.60	.60	1.20	1.65
1913	3.40	.60	.65	1.25	2.15
1914	2.85	.60	.60	1.20	1.65
1915	2.85	.55 (b)	.60	1.15	1.70
1916	3.55	.55	.70	1.25	2.30
1917	5.05	.55	1.20	1.75	3.30
1918	5.25(a)	1.00	1.20	2.20	3.05
Average					$1.89

(a) An average of the various prices set by the government during the year.
(b) From June 1, 1915.

less than the standard, as well as the penalty resulting from the failure to ship ore meeting the base price, which, as stated, is a direct charge in itself of from 15 to 20% a ton.

Figures presented to the Federal Trade Commission under oath early in 1918 showed the cost of delivering Mesabi non-bessemer ore to Lake Erie to be $5.01. Deducting from this the cost of getting the material to Lake Erie, shown in the table to be $2.20, leaves $2.81 as cost at the mine. As shown, the gross return to the mine for that year on the standard-base ore of 51.50% iron is $3.05. As average Mesabi non-bessemer shipments averaged 50%, and as the unit price of non-bessemer ores was 11.36c., 17c. must be deducted from this $3.05, making the actual gross return to the mine $2.87, showing a theoretic net profit of 6c. a ton.

Mining in Australia

MELBOURNE CORRESPONDENCE

The Chillagoe Co., of North Queensland, after many reconstructions, will soon cease to exist. The company was formed originally in 1898 to work the leases at Chillagoe and to construct a railway from Mareeba, in the Cairns district, to Chillagoe, a distance of 102 miles. The line was subsequently extended to Ethridge via Einasleigh, a distance of 147 miles. The railway has always been a good revenue producer, but the company's mines were unable to provide the necessary ore to keep the smelting works operating profitably. Finally the debenture holders took possession of the property, and as a result of an agreement the Queensland government has acquired all the company's holdings, with the exception of the Mount Mulligan coal mine, which will probably be sold to a new company. The railways will be placed under the control of the state-owned system; the smelting works will be reopened by the government for the benefit of the district, representations having been made that the small producers can find no outlet for their ore; and the government itself intends to operate the Einasleigh copper mine, which was the company's principal producer in recent years.

The failure on the part of the commonwealtn government to arrange for any extension of the copper contract, the embargo on the export of ores, and the low prices now ruling, are effecting the Australian mining industry detrimentally. The Electrolytic Refining the Smelting Co., Port Kembla, which refines copper from Mount Morgan and Mount Lyell and also purchases ore and matte from many of the other mines, has found it necessary to restrict its operations considerably; and, although the larger copper mines are still working, many of the medium-sized and smaller producers are closed down. The general feeling is that the position is only a temporary one and that conditions abroad, which are governing prices ruling here, will soon improve.

The position with regard to the silver-lead mines is not so acute as with copper, because of the fact that, until recently, the British government has been purchasing the lead output at a price equivalent to about £32, delivered in London. But now that this agreement has expired, the ruling low market prices for lead will seriously affect producers.

A deputation recently waited on the Commonwealth Prime Minister, to present a series of resolutions carried at the gold producers' conference. E. C. Dyason, president of the Victorian Chamber of Mines and managing director of the Bendigo Amalgamated Gold Mines, said that the proposals of the members of the delegation could be reduced to three main headings. The first was the abolition of the embargo on the export of gold, or, as an alternative, the paying of the "export parity" on the gold required in Australia. They desired this to apply only to new production. The second request was the removal of state and federal taxation on the gold-mining industry, and the relaxing or removal of the restrictions on the formation of gold-mining companies. At present the taxation was imposed largely on the basis of the few prosperous companies, and fell heavily on an industry which, as a whole, was not profitable under present conditions. In the third place, they desired the encouragement of prospecting by the federal and state governments. The conference decided that the best method of stimulating prospecting was to offer substantial rewards, as high, perhaps, as £10,000 or more, for good discoveries. The commonwealth would not lose if no discoveries were made, whereas, if they were made, the community would benefit immensely.

The only concession given to the deputation was a promise by Mr. Watt. For three months at least the free export of gold would be permitted, subject to a proper measure of control to prevent the gold getting into the hands of those whose possession of it might prove to be detrimental. This concession will apply only to new gold; and the banks are precluded from taking any part in it. To carry out the proposal the Australian Gold Producers' Association has formed a limited company, and all bona fide gold producers are being invited to join. The subscription, division of profits, and voting will be upon the basis of production. A shipment of sovereigns has already been made on behalf of the new association; and, although the full price quoted was not realized, it is understood that a satisfactory profit has been made.

Manganese Ore Mines of Ecuador from which a number of shipments have been made to the United States are situated near San Antonio, Ecuador, according to *Iron Age*. The claims cover about 1⅓ square miles. The principal deposit so far discovered consists of a vein 3 to 9 ft. thick, and an extension of about 21,000 sq.ft. An analysis made by a New York chemist shows the following composition: Manganese, 46.36%; iron, 1.55%; copper, 0.02%; phosphorus, 0.140%, and silica, 6.44%.

Will It Come to This?

A plain consulting engineer
Is writing for advice.
I've sent the bill for a report
And had it sent back twice.
My client says, "The bill's too big,"
For a "thing so damned prosaical."
So I've changed the style to suit him, but
To me it's lackadaisical.

"Prosaical" means what it says.
Do you think that this way
Of writing in Walt Mason style
Would make my client pay?
And, with the "izes" running loose,
It hardly seems amiss
To ask if we will have to write
Our field reports, like this:

LOCATION

The claims that make the "Bull Con" Group
Are fourteen, to a fraction,
And situate along a line
Of great volcanic action.
They're two miles south of Hope Deferred,
A mile east of the river,
Where water for a mill is found,
And can be reached by "flivver."

TOPOGRAPHY

A line of cliffs, due east and west,
Rises to an elevation
Of more or less a thousand feet
Above the railroad station
At Hope Deferred. Out to the north,
A terminal moraine
Gives evidence conclusive that
The whole was once a plain.

GEOLOGY

The country rock in general
Is granite, pegmatitic,
With faults and dikes and sills and flows
In manner quite erratic.
The territory showing ores,
(By quite the larger fraction)
Shows many evidences of
A metamorphic action.

For half a mile. due east and west,
There runs a major fault,
Which proved a zone of weakness
To intrusions of basalt.
From north to south are other faults,
With filling porphyritic,
Of bostonite and biotite,
And others, andesitic.

Surcharged waters, from great depths,
With metamorphic action
Deposited the metals which
They held by least attraction.
Along the zone of major fault
Are many indications
That at a depth there may be found
Magmatic segregations.

DEVELOPMENT

But little work was ever done,
Aside from the shaft sinking,
And from its very nature shows
The prospectors were thinking
That they would cut "Bonanza" ores
To pay them for their labors,
Or they could sell the property
To one of their near neighbors.

The "Bull Con" shaft, two hundred feet,
Was sunk as an incline
Along the main fault, and with depth
Might make a paying mine.
The lowest level (Number Two),
Is just above a sump,
Where water from the workings is
Raised with a sinking pump.

The surface shows a lot of cuts
Put down to hold locations,
Or, put down on the cross faults, which
Showed plainest indications
That metamorphic action had
Effected depositions,
Or segregations had occurred
In shallower positions.

ORES

Along the pegmatitic fault
The ores have all been leached,
But in the main, and deepest shaft,
The sulphides have been reached.
The outcrop, now a gossan,
Is too poor to pay for mining,
Since the recent rise in charges
For both smelting and refining.

Where the sulphides were encountered
A condition has been noted;
The copper, lead, and zinc, and iron
Can probably be "floated."
Gold goes with the iron and copper,
Silver, with the zinc and lead.
This is demonstrated constant
When the assay sheet is read.

SAMPLES

Sample 1, from the first level
Shows the lead 19 p. c.
Traces each, of zinc and copper,
With 9 ounces of Ag.
Three feet of this ore was sampled,
While, out toward the hanging wall,
There is two feet of fault breccia
Showing values—none at all.

Ten feet further in the level
We cut Sample Number 2,
Which gave nine point five in copper,
And point seven three Au.
One point four was all the silver,
Two point seven of Pb.
Six point nine per cent. of sulphur,
Twenty-one per cent. Fe.

There was five feet of this sample
(Which was cut from wall to wall)
But, advancing in the level,
Values take a sudden fall.
Fourteen feet beyond the second
Sample, and right in the face
We find pyrite, very massive,
Gold and silver, but a trace.

Dropping to the second level,
Both the walls are well defined.
There has been a little stoping,
And some copper ore was mined.
From the smelter liquidations
On ores shipped in nineteen-eight,
Fourteen carloads, shipped to Denver
Barely paid the railway freight.

Sample 4 was from a prospect
On a cross fault farther west.
Shows a vein, though somewhat narrow,
High in silver, and the best
Of the samples that were taken.
(Nine hundred ounces to the ton)
And these ores resemble greatly
Those as shown by Sample 1.

The grade of ores from samples taken,
If averaged, would be
Five four Cu; point six Au,
And six point six Ag.
The leady ores show low Cu,
And are higher in Zn;
Pb nineteen, Fe fourteen,
Au but nought point ten.

The silver, one nine eight point four,
Was higher than expected
And, fearing it was "salted,"
Was properly rejected.
The ores are of a character
Requiring separation,
And this could be accomplished by
The process of "flotation."

RECOMMENDATIONS

The river level offers
A location for attack
That will provide for drainage, and
Can be reached by a track
Extended from the main line, from
The town of Hope Deferred,
The only serious drawback
Being costs to be incurred.

While the ores may not continue
To the level of this drive,
Every foot of tunnel driven
Gains a depth of four or five.
From the showing made in sinking,
Values, gaining depth, enhance.
Therefore, it is recommended,
Drive the tunnel. Take the chance.

CONCLUSIONS

Just like any mining venture,
Cash invested may be lost,
But the general conditions
Justify the tunnel's cost.
Values shown by careful sampling,
Show a profit can be made
Even if the ores extracted
Fall below the average grade.

Terms, as stated in the option,
Might be slightly modified
To extend the final payment
Till the tunnel scheme is tried.
The price demanded for the claims
Would really seem to be
Approximately what they're worth.

I. TISAGUESS, C. E.

Copper Mining in Venezuela

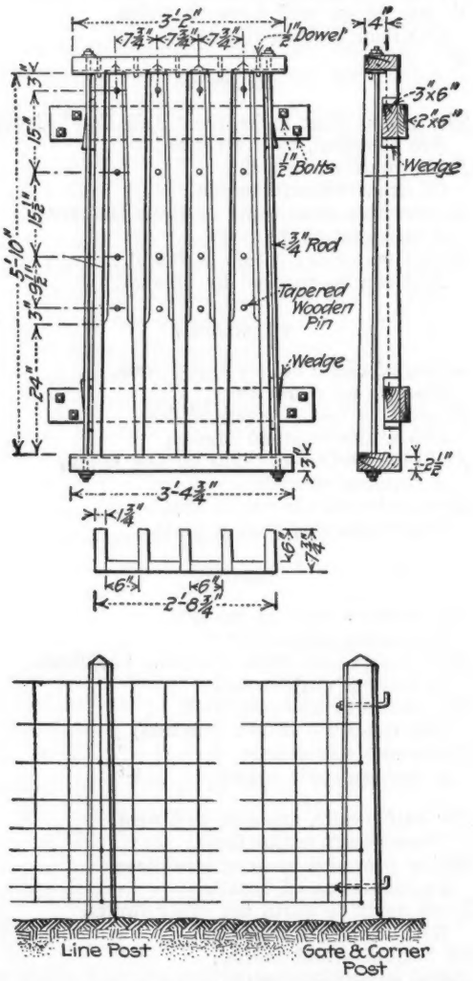
The only important mining operations in the Puerto Cabello district of Venezuela are carried out at the copper mines of Aroa, State of Yaracuy, by the South American Copper Syndicate, Ltd., a British corporation, states a consular report. These mines were first worked in the days of the Spaniards. From 1862 to 1880 they were under control of a British company, and a large output was reached. They were then closed for a period of about 15 years, after which they were reopened by the company now operating them. They have experienced unusual prosperity since the war. In 1917 the output was 41,289 tons of ore, containing about 7% copper, the largest production since the mines have been under control of the present company. The total output of copper ore in all Venezuela was 42,271 tons in 1917.

Form for Concrete Fence Posts

BY A. H. SAWYER*

A collapsible form for making four concrete line fence posts at a time is illustrated herewith. A form for gate and corner posts would be similar but larger, as these are 8 in. at the butt, 6 in. at the top and 1 ft. longer. The posts are designed to carry 40-in. field-fence wire, but the design can easily be altered to suit other sizes of fencing.

The holes in the posts correspond to the longitudinal fence wires, and are made by inserting tapered wooden pins in the form and removing them while the concrete



CONCRETE FENCE POSTS AND FORMS FOR MAKING

is still green. Hook bolts ⅜ in. in diameter and of different lengths to suit the thickness of the posts hold the wire in place.

In the gate posts, two ¾-in. pipes are inserted to provide holes for the gate hinges, as shown in the sketch. The chamfering of the corners and pointing of the tops of the posts are easily done and considerably improve the appearance.

Lincoln Said: "Don't fail to keep that pledge and it will be the best act of your life." This advice applies today. If you couldn't assume your full share of Liberty Bonds in 1918, buy Victory Notes to the limit now.

*With Gulf States Steel Co., Brown-Marx Bldg., Shannon, Alabama.

Company Reports

Phelps Dodge Corporation

The annual report of the Phelps Dodge Corporation for 1918 covers the operations of the Copper Queen branch, Morenci branch, Burro Mountain branch, Copper Basin branch, and Stag Canyon branch of Phelps Dodge Corporation, together with those of the Moctezuma Copper Co., Bunker Hill Mines Co., and Phelps Dodge Mercantile Company.

The copper ore extracted in 1918 from the various properties amounted to 2,684,701 tons, of which 106,037 was mined and shipped by lessees. Of the total ores mined, 1,797,161 tons was given preliminary concentration and 887,184 tons smelted direct. The total amount of copper-bearing material smelted at the plants, including ore, concentrates, old slag, scrap, and cement copper, was 1,400,911 tons. The copper bullion contained 32,709 oz. gold and 2,307,307 oz. silver.

There was also mined and sold 5942 tons of manganese ores and concentrates from the Copper Queen and Bunker Hill mines and 704 lb. of molybdenum sulphide from the Moctezuma Copper Co.'s La Fortuna and Bella Union mines.

Of the ores and concentrates smelted at the reduction works, 1,168,882 tons was developed from the company's properties, 188,074 tons was general custom ores, and 43,955 tons was treated for the United Verde Extension Mining Company.

Unit costs in almost all operations show an increase, in sympathy with the increased cost of labor and supplies, although, as a whole, they have not risen to the same degree. Three adjustments of wages in the form of advances were made during the year, so that the wages during the last quarter were paid on a basis of 32-c. copper when the market price was only 26c. per pound.

Up to the time of the signing of the armistice maximum output was being well maintained, but since then the lack of demand for copper and the lower price have called for a drastic curtailment and reduction in costs.

The total output of the Copper Queen reduction works was in 1918 the largest in the history of the plant. Much valuable investigation work in connection with metallurgical problems was accomplished during the year, which will now be followed by large-scale tests to prove results definitely.

At the Copper Queen branch, credit is due to the mining department for maintaining production with, at times, less than 70% of the normal crew, as well as for keeping the major operating costs down, in the face of increasing labor and supply costs. The ore reserves at the end of the year showed a slight increase.

The metal produced from the ores of the branches and subsidiaries of the Phelps Dodge Corporation during the year was 169,035,687 lb. copper, 1,683,113 lb. lead, 1,772,119 oz. silver and 30,434 oz. gold; and, in addition, ores were purchased or smelted on toll at the reduction works, which yielded 43,348,592 lb. of copper, 973,040 oz. silver and 6778 oz. gold.

Dividends, regular and extra, to the amount of 24% were declared during the year. In addition, distributions of 6% were made from the reserve for depletion, of which 4% was declared in the form of U. S. 4¼% Liberty bonds. The dividend and the distribution declared in December were made payable in January, 1919.

Utah Copper Co.

The 1918 annual report of the Utah Copper Co. shows that the gross production of copper in concentrates and leaching plant precipitates for the year was 196,600,165 lb. The shipments of crude ore contained an additional 1,378,392 lb. After making smeltery deductions, the net production was 188,092,405 lb. The production of gold amounted to 50,928.217 oz. and of silver to 489,483.74 oz. The net cost of production of all copper during the year, after deducting miscellaneous income, including revenue as dividends from the Bingham & Garfield RR. Co. and deducting the value of the gold and silver contents, but not including the dividends received from holdings in the Nevada Consolidated Copper Co., was 14.533c. per lb., as compared with 10.995c. per lb. for the previous year. The increase in cost was caused by the large increase in the cost of labor, supplies, freights, smelting, and refining.

The net operating income was $13,807,302.65. The income from interest, rentals and dividends on investments amounted to $5,138,477.31. A direct charge was made against income for the amount contributed to the Red Cross and the United War Work funds in Liberty Bonds at their par value, $500,000. The total income applicable to dividends or for other capital purposes therefore aggregated $18,445,779.96, or $11.35 per share, as compared with $17.66 per share for the previous year. Total disbursements to the stockholders for the year were $10 per share, or $16,244,900, of which $12,589,797.50 was dividends and $3,655,102.50 in capital distribution.

The total amount distributed to stockholders down to and including Dec. 31, 1918, has been $92,015,782.50 in cash.

Chino Copper Co.

The annual report for 1918 of the Chino Copper Co. shows that the gross copper production for the year in concentrates and direct shipments was 79,340,372 lb. Smeltery deductions reduced the net production to 75,655,641 lb. In addition, gold and silver valued at $39,731.91 was produced. The net cost of producing copper for the year was 17.178c. per lb., as compared with 11.39c. per lb. for the year 1917. The increase in the cost of production was caused by the great increase in the cost of labor, supplies, freights, smelting and refining.

The net income was $4,010,272.15; miscellaneous income, rentals, and like charges were $43,051.75; total from all sources, $4,053,323.90. There was directly

charged to income the amount contributed to the Red Cross and the United War Work funds in Liberty Loan bonds owned by the company, $145,101.65, being the cost price of $150,000 par value of these bonds. The total net income, therefore, amounted to $3,908,222.25, or at the rate of $4.49 per share, as compared with $10.93 per share for the year 1917.

Disbursements were made to stockholders during the year as follows: First quarter, dividend of $1.50 per share; second quarter, dividend of $1 per share; third quarter, $1 per share (being 75c. dividend and 25c. capital distribution); fourth quarter, capital distribution of $1 per share. Dividends and capital distributions for the year amounted to $4.50 per share, or $3,914,910, of which $2,827,435 was dividends and $1,087,475 was capital distributions. The total disbursements to stockholders up to and including Dec. 31, 1918, have amounted to $26,403,042.

Nevada Consolidated Copper Co.

The Nevada Consolidated Copper Co. has recently issued a report for the fourth quarter of the fiscal year ended Dec. 31, 1918. Production of copper for the quarter was 19,020,773 lb., as compared with 18,643,216 lb. for the preceding quarterly period. The total production of copper for the calendar year 1918 amounted to 76,607,062 lb. During the quarter, 985,665 tons of Nevada Consolidated ore, averaging 1.51% copper, was milled, as compared with 1,003,898 tons, averaging 1.50% copper, for the previous quarter. Of the tonnage milled, 68% was supplied from the pit and 32% from the underground workings of the Ruth mine. In addition to the treatment of company ores as above, 21,765 tons of customs ore was concentrated, and the resulting concentrate, together with 17,864 tons of customs ore and concentrates, was smelted at the Steptoe plant.

The cost of production per lb. of copper for the quarter, including Steptoe plant depreciation and all fixed and general charges, was 19.01c., as compared with 20.70c. for the third quarter, and as compared with 17.88c., the average cost per lb. for the first six months of the year. These costs do not include credit for gold and silver or miscellaneous earnings, which for the current quarter amounted to 1.82c., for the previous quarter 2.05c., and for the first six months of the year 2.53c. per lb. of copper. The comparatively high costs for the current quarter, as well as those of the preceding quarter, are occasioned by the higher freight rates imposed by Federal tariffs, additional refinery tolls, and continued high wage schedules.

The financial results of operations for the calendar year are as follows:

FINANCIAL STATEMENT OF NEVADA CONSOLIDATED COPPER CO., FOR FISCAL YEAR ENDED DEC. 31, 1918

Surplus balance Dec. 31, 1917		$13,180,525.97
Earnings from mine, investments and miscellaneous		3,459,879.73
Total		$16,640,405.70
Subscription to American Red Cross	$50,000.00	
Subscription to United War Fund	100,000.00	
Charged costs for plant abandonments	57,809.20	
Dividends paid at 3.25 per share	6,498,235.25	6,706,044.45
Surplus balance Dec. 31, 1918		$9,934,361.25

This statement is subject to such revision and correction as may be necessary, to include tax accrual adjustments, and other entries in the final closing of the accounts for the year. The reduced earnings for the quarter are based upon an average copper price of 17.23c. for the quarter. This low average price is due to the accumulation of an unusually large stock of unsold copper, which is held in company metal inventory at the established carrying price of 13½c. per pound.

Tennessee Copper and Chemical Corporation

The annual report for 1918 of the Tennessee Copper and Chemical Corporation shows that the production of sulphuric acid during the year amounted to 283,092 tons of 60° acid, as compared with a production for the previous year of 262,858 tons. The production of copper was 9,819,838 lb. from company ore, as compared with 10,547,708 lb. in the previous year. An arrangement was made with the International Agricultural Corporation under which an increased price was paid for all acid delivered in excess of 175,000 tons during the year 1918. Under this arrangement the average price received for acid was $6.49 per ton, but would have been considerably higher had not production during the last quarter of the year been curtailed by reason of the influenza epidemic.

Four increases in wages were granted during the year, and this, together with the high prices prevailing for coal and coke, largely increased the costs over those of the previous year and decreased the net profits. Dividends paid during 1918 amounted to $392,817.

American Zinc, Lead and Smelting Co.

The 1918 annual report of the American Zinc, Lead and Smelting Co. and its subsidiary companies shows that the total profits amounted to $911,415.98. Dividends on preferred stock amounted to $482,637. During the year the natural-gas zinc smeltery at Neodesha, Kan., was dismantled, as in large part also was the natural-gas zinc smeltery at Dearing, Kan., the gas supply for these smelteries being exhausted. Substantial amounts were realized for the material sold.

Improvements to properties during the year consist principally of additions to the zinc-oxide plant at Hillsboro, Ill.; additions to the sulphuric-acid plant at East St. Louis; installation of pumps and further development of No. 4 shaft at Mascot, Tenn.; additions and improvements to housing facilities at various properties, and installation of mechanical hearths at the lead smeltery.

U. S. Smelting, Refining and Mining Co.

The annual report of the U. S. Smelting, Refining and Mining Co. for 1918 states that, with the exception of the high costs pertaining to supplies, the operations in Mexico during 1918 may be considered to have run on a normal basis. The two mills treated 690,000 tons of ore during the year, approximately 58,000 tons a month. Extraction of ore from the new vein was increased from month to month, and will, before long, reach the anticipated steady tonnage. This ore being of much higher grade than the average formerly supplied to the Guerrero mill has had the effect of materially raising the mill heads, resulting in a substantial increase in profits. No difficulty is expected in maintaining these results. A moderate tonnage of the highest grade ore obtained from this vein is being shipped directly to the smeltery.

The output from this vein and from other localities, both in the Real Del Monte and Pachuca districts, is capable of an increase beyond the present capacity of the company's two mills. This situation will be met by the additions to the mills which were started last year and are now approaching completion. It is expected that by the middle of 1919 the capacity will reach 80,000 tons a month. The erection of a third mill of 15,000 tons' monthly capacity is still under consideration. Tests are not completed to determine the best process to be adopted in its construction, neither do costs and deliveries of materials favor construction at this time. In view of the more stable general conditions in Mexico, and the favorable results in opening up ore reserves, the prospects for earnings in these properties are favorable.

The metals produced in 1918, including those from custom ores and the production in Mexico, were as follows: Copper, 20,359,378 lb.; lead, 96,567,485 lb.; zinc, 18,771,684 lb.; silver, 15,337,465 oz.; gold, 137,315 oz. The profit for the year was $4,775,090.21, from which dividends amounting to $3,457,800 were paid.

Jim Butler Tonopah Mining Co.

A recently issued report, covering the operations of the properties of the Jim Butler Tonopah Mining Co., at Tonopah, Nev., for the period of 15 months from Oct. 1, 1917, to Dec. 31, 1918, shows that shipments aggregated 27,352 tons. The average metal content was 0.249 oz. gold and 21.97 oz. silver per ton.

The gross value of the metals in the ore produced by company operation was $724,009.13, or an average per ton of $26.15, as compared with the gross value of the previous year of $1,052,600.67 and the average per ton value of $26.12. The total operating costs were $13.61 per ton, or an increase of $1.67 per ton over the similar costs of the preceding year.

Development costs per ton were $1.75, as compared with $1.06 for the previous year. Transportation costs were reduced, by reason of the shipments to the Belmont mill at Tonopah rather than to the mill at Millers, from the 71c. for the previous period, to 53c. per ton. Treatment charges were reduced, on account of more favorable milling contracts, from $5.33 per ton during the previous year, to $3.98 per ton. Mill deductions (losses in tailings and shipping and marketing of products) were increased from $1.79 in the previous year to $2.14 per ton, a greater part of the increase being due to the higher value of the silver lost in tailings. Combined treatment charges and mill deductions were, however, less by $1 per ton than during the previous year. The percentage of profit during the period was 40.92%, as compared with 45.52% during the previous year. Dividends paid during the period aggregated $292,063.57.

Tonopah Belmont Development Co.

A report descriptive of the operations of the Tonopah Belmont Development Co. for the fiscal period of 10 months ended Dec. 31, 1918, shows that the Belmont mine and mill at Tonopah continued operations, with but minor interruptions, throughout the period. The Tonopah mill treated, in addition to 87,089 tons of Belmont mine ores, about 60,361 tons of custom ores, most of which was purchased from the Tonopah Mining Co. and the Jim Butler Tonopah Mining Co. The milling plant at Millers, Nev., which had been partly dismantled during the previous year, remained idle. The re-treatment plant for the milling of sweepings from the slime tailings ponds was operated for six weeks. From 87,089 dry tons of Belmont mine ores, earnings were $567,980.54. A profit of $14,373.76 was made from the treatment of 60,361 tons of custom ores; and from tailings-lease royalties, slimes re-treatment plant operations and miscellaneous earnings profits of $9,134.45 accrued.

Consolidated Interstate-Callahan Mining Co.

The annual report for 1918 of the Consolidated Interstate-Callahan Co., shows that the amount of ore delivered to the mill was 84,720 dry tons. From the tonnage taken from the mine to the mill there was 2757 tons of crude zinc ore, assaying 48.3% zinc and 3.46% lead; 1634 tons of crude lead ore, assaying 54.7% lead and 19.91 oz. silver, and 11,462 tons of waste sorted from the belt. The remainder, 68,867 tons, went through the mill. An average of 525 tons a day is now being mined, and the management expects to increase this output, so that an average of 6000 tons per month of zinc and lead-silver ores will be shipped.

The flotation section was completed in the early part of the year, and on June 1 the old part of the mill was closed for repairs, during which time the flotation unit was used to treat tailings. During June, July, August, September, and October, a total tonnage of 46,802 tons of slime tailing, assaying 13.96% zinc and 2.16% lead, and 37,245 tons of tailing, assaying 7½% zinc and 2.4% lead, was treated from the stockpile. This tailing was recovered by a Sauerman slack line cable excavator at low cost. The flotation concentrates made were passed over ten Deister-Overstrom slime tables and four Wilfley tables, and in this way it was possible to separate a lead from a zinc product.

Dividends paid during the period amounted to $456,222.25.

Butte & Superior Mining Co.

The Butte & Superior Mining Co.'s seventh annual report, that for the year ended Dec. 31, 1918, shows that 468,814 tons of ore was milled during the period, of an average content of 15.928% zinc and 6.335 oz. silver per ton. The extraction of zinc in the form of concentrate amounted to 92.965%. The total production of zinc concentrate amounted to 135,543 tons, with an average content of 51.217% zinc and 20.029 oz. silver per ton. Lead concentrate amounted to 2790 tons.

During the year an improvement in milling and concentrating methods was effected whereby the zinc concentrate production averaged 3.74% higher in zinc content and 2.23 oz. per ton higher in silver content than during the previous year, with an increase in extraction of 1.84 per cent.

Estimate of ore reserves, as of Dec. 31, shows 830,000 tons, averaging 17% zinc and 5.7 oz. silver per ton. The net operating revenue amounted to $12.617 per ton. Mining cost $7.591 per ton, and milling $2.951. The balance to surplus account amounted to $628,348.28.

Pending litigation and other conditions have caused the management to decide to defer declaration of dividend for the present.

Industrial News from Washington

BY PAUL WOOTON, SPECIAL CORRESPONDENT

War-Minerals Relief

The Anaconda Copper Mining Co. is expected to file the largest single claim which has yet been submitted to the War-Minerals Relief Commission. It is understood unofficially that the claim will be slightly in excess of $1,000,000. The smallest claim which has been filed to date is for $39.90.

The commission is not willing at this time to make public a full list of the claimants, with the amounts of each claim, but it is possible that this information will be given out later. It may be stated, however, that the following are among those who have filed the largest claims: Bethlehem Mines Corporation, Bethlehem, Penn.; Grasselli Chemical Co., Cleveland; Southern Pyrites Ore Co., Atlanta; Parke, Shepherd & Wilson, Batesville, Ark.; Sulphur Gulch Manganese Mines, Oakland, Calif.; United States-Canada Mining Co., Trenton, N. J.; W. A. Sanger, Big Pine, Calif.; John F. Barneberg, San Luis Obispo, Calif.; Wells Chrome Lease, San Francisco; Liberty Manganese Mining Co., Salt Lake City; Tristate Chrome Co., Spokane, Wash.; John Peterson, Helena, Mont.; National Mining Co., Wilmington, Del.; Karl Olsen, Wilmington, Del.; G. L. Finster, Patterson, Calif.; L. H. Van Horn, Jacksonville, Ore.; Hanna Minerals Co., Cleveland; Suffren Co., Inc., New York; St. Anthony Mines Leasing Co., Fanning, Nev.; Independence Mining Co., Batesville, Ark.; John Bouse, Berkeley, Calif.; Chestatee Pyrites and Chemical Co., Atlanta; K. G. McLaughlin, San Francisco; Paga Mining Co., Cartersville, Ga.; Collier Mines Co., Santa Fe, N. M.; A. H. Stow, Bluefield, W. Va.; Eureka Manganese and Mining Co., Cushman, Ark.; Chrome Mining Co., Philadelphia; Oklahoma-Kansas Mining Co., Miami, Okla.; Victor Rakowsky Co., Joplin, Mo.; Boulder River Chrome Co., Great Falls, Mont.; Oneida Mines Co., Duluth; Maryland Chrome Corporation, Baltimore; National Pyrites and Copper Co., Birmingham.

Sale of Sulphur and Nitrate Stocks

The Director of Sales, War Department, announces that contracts have been made to dispose of War Department surplus stock of sodium nitrate, sulphur, and copper. This material will be sold, by the firms contracting with the War Department, at current market prices. Anyone desiring to purchase part of this material should communicate direct with the companies concerned.

Sodium nitrate will be sold for the War Department by the W. R. Grace Co., Wessel, Duval & Co., and H. B. Baker Co., of New York City, and the du Pont Nitrate Co., of Wilmington, Del. The surplus stock of sulphur will be sold by the Union Sulphur Co., of New York City. The surplus stock of copper will be sold by the United Metals Selling Co., of New York City.

The sale of these materials will be extended over a period of time, and they will not be dumped on the market in a way that would change, in the slightest degree, the market price or market conditions.

The Rehabilitation of Europe

The obstacles in the way of an immediate great overseas trade to Europe are of two general kinds, positive and negative, the one tangible, as in the nature of an artificial barrier, and the other a void where there was formerly an active facility, writes Burwell S. Cutler in *Commerce Reports*. Embargoes answer to the first definition, and lack of ships and credits to the second.

Quick and heavy buying presupposes a fat and ready pocketbook, but the pocketbook is almost, if not quite, empty. Europe is in the position of a man who has overdrawn his credit at the bank and must come again to terms with his bankers—very severe terms—before his check is good for the next month's rent. A temporary policy of home economy against foreign goods is not only allowable—it is wisdom itself. Great Britain must turn out goods with which to pay its debts to us, for we already have plenty of gold to stabilize our currency, and further shipments to us would make remittance by British dealers for our merchandise impossibly expensive.

That some day trade on a vast scale to and from Europe is inevitable no one can deny. Exactly when it will have reached its maximum proportions, what seer can foretell? We cannot expect a sudden flowering of the golden bud. Many a frost may delay its growth. A misplaced geographical boundary as a cause of new war; an internal revolution with characteristic economic demoralization; the sudden ascendancy of a rabid protectionist or free-trade statesman; an inimical political alliance; a Germany too extensive or a Germany in fragments—such deterrents may possibly operate at one time or another. But gradually, through struggle and muddling and true inspiration, the European mélange will shake itself like a kaleidoscope into orderly arrangement.

The instinct of self-preservation will bring stability, as the indispensable condition of contented human existence. Here and there a factory will start and will need new machinery and raw materials; a home will be rebuilt, and will need furnishing; a railroad will be revamped, and will need rails—all of them simple supplies, but comprehensive and running into billions of dollars.

Claims Against Mexican Government

The State Department at Washington, recognizing the lack of standardization in the manner in which claims against the Mexican government are being filed, is now preparing a standard form for that purpose. It is expected that the final form will be prepared for approval by the middle of May.

As soon as it is available, copies will be sent to members of the National Association for the Protection of American Rights in Mexico, that they may re-submit their claims. The new form will supersede all previous ones in which claims against Mexico by American citizens have been filed. Those who intend filing claims are advised to await this new standard form.

April Mining Dividends

The decrease in dividends paid by copper companies continued in the month of April, 1919, reductions being made by Inspiration (from $2 to $1.50 per share), Phelps Dodge (from $8 to $2.50) Shattuck Arizona, (from 50c to 25c.), and Wolverine ($1 to 50c). Magma, New Idria and Ontario passed the quarterly dividends which would have been due at this time.

Dividends paid in April, 1919, by 19 United States mining and metallurgical companies making public returns, amounted to $5,025,926, as compared with $7,294,751 paid by 30 companies in April, 1918.

United States Mining and Metallurgical Companies	Situation	Per Share	Total
Am. Smelters, pfd. A	U. S.-Mex.	$1.50	$146,071
Am. Smelters, pfd. B	U. S.-Mex.	1.25	42,962
Caledonia, l. s.	Ida.	.01	26,050
Cresson Cons., g.	Colo.	.10	122,000
Daly, l.s.	Utah	.10	15,000
Electric Point	Wash.	.03	23,813
Golden Cycle, g.	Colo.	.03	45,000
Grand Central	Utah	.04	20,000
Homestake, g.	S. D.	.50	125,580
Inspiration, c.	Ariz.	1.50	1,772,951
Judge, l.s.z.	Utah	.12½	60,000
Phelps Dodge	U. S.-Mex.	2.50	1,125,000
Portland, g.	Colo.	.02	60,000
Shattuck Arizona, c.	Ariz.	.25	87,500
Tonopah Belmont, g.s.	Nev.	.10	150,000
Tonopah Ex., g.	Nev.	.05	64,140
Tonopah Min., g.s.	Nev.	.15	150,000
United Eastern, g.	Ariz.	.07	95,410
U. S. Smelting, com.	U. S.-Mex.	1.25	438,894
U. S. Smelting, pfd.	U. S.-Mex.	.87½	425,555
Wolverine, c.	Mich.	.50	30,000
Canadian and Central American Companies			
Asbestos Corpn., com.	Que.	$1.25	$37,500
Asbestos Corpn., pfd.	Que.	1.50	60,000
Belmont Surf Inlet, g.	B. C.	.05	125,000
Cons. Min. and Sm., c.s.l.	B. C.	.62½	261,936
Florence Silver, s.l.	B. C.	.01½	17,650
Howe Sound, c.	B. C.	.05	99,208
McIntyre Porcupine, s.g.	Ont.	.05	180,514
McKinley-Darragh-Savage, s.	Ont.	.03	67,431
N. Y. & Honduras Rosario, g.s.	C. A.	.50	100,000
Nipissing, g.s.	Ont.	.25	300,000

Canadian and Central American mining companies paid $1,249,239 in April, 1919, and $903,506 in April, 1918.

The totals for the first four months of 1919 are as follows, the 1918 figures being given in parentheses: United States mining and metallurgical companies, $34,459,932 ($54,556,275); holding companies $696,572 ($743,433); Canadian, Mexican, Central and South American companies, $5,863,751 ($5,531,281).

California Mineral Production

The California State Mining Bureau has issued a bulletin giving the following details regarding production of certain minerals in 1918:

Asbestos production in 1918 amounted to 229 tons, compared with 136 tons in 1917. The material was mostly of the chrysotile variety and came mainly from Nevada County.

The output of borax in 1918 amounted to 88,772 tons, against 109,944 tons in 1917. The product came entirely from the colemanite deposits of Inyo and Los Angeles counties.

Cement produced in 1918 amounted to 4,772,921 bbl. compared with 5,790,734 bbl. in the preceding year. The value of the cement showed an increase of $425,627 in 1918, owing to the higher selling price, although there was a decrease in the amount of cement used, on account of the war.

The output of pyrite amounted to 131,029 tons in 1918, as against 111,325 tons in 1917. The material came from two properties in Alameda County, and one property in El Dorado and Shasta counties respectively, and was utilized for the manufacture of sulphuric acid.

There was a small output of barytes in Monterey County; cadmium in Shasta County; fluorspar in Riverside County; lithia mica in San Diego County; onyx marble in Solano County; and serpentine "marble" in Los Angeles County, of a total value of $97,732. As there was but a single operator on each of these substances, the individual figures are not disclosed.

A small tonnage of sulphur was produced in 1918 at each of the two plants in Colusa and Inyo counties toward the end of the year, but none of the product had been shipped up to Dec. 31.

Army Gas Masks in Sulphur-Dioxide Atmospheres

Owing to a transposition of cuts, the captions used under Fig. 1 and Fig. 3, on p. 693 of the *Journal*, Apr. 19, 1919, are in error. Fig. 1 is the Tissot-type of gas mask and Fig. 3 is the U. S. Army gas mask, mouthpiece type.

Mining Accountants Wanted

The U. S. Civil Service Commission announces an open competitive examination for mining accountants, for men only. Vacancies in the Bureau of Mines, Department of the Interior, with headquarters in Washington, D. C., or in the field, at $2400 to $4200 a year for Grade 1, and $4200 to $6000 a year for Grade 2, and in positions requiring similar qualifications, will be filled from this examination, unless it is found in the interest of the service to fill any vacancy by reinstatement, transfer or promotion.

Certification to fill the higher-salaried positions in either grade will be made from those attaining the highest average percentages in such grade. Appointments as a result of this examination will be made on a monthly basis, but the work may continue for a year or more. The duties of appointees to Grade 1 positions will be to examine the accounts of producers of minerals in connection with claims made for losses growing out of the war with Germany. The duties of appointees to Grade 2 positions will be to supervise the work of a number of accountants of Grade 1.

Competitors will not be required to report for examination at any place, but will be rated according to education, training, and experience. A report or discussion must be filed with the application.

Lead Prices Affect Monterey Smelters

The smelters in Monterey are being seriously affected by the price of lead in the British markets, as they pay the mines for the lead contents of their ores at the price of lead in London at the date the ore is purchased in Monterey, says a consular report.

A short time ago the British government stopped the control of the prices of metals, and the value of lead jumped from £29 to £40. As the Monterey smelters consider this only a temporary flurry in the market, they are refusing to buy lead ores until the market settles down again. As a result, numbers of the mines in the northern part of Mexico have been forced to close down, the local smelters have been obliged to reduce their staffs, and many changes are being made among both the Mexican and foreign employees.

Save and Have—Buy Victory Notes.

Editorials

Prosperity—Let's Go

A CAREFUL review of the present status of the Peace Conference might cause some to feel pessimistic, but is it not true that in all such conferences there frequently occur wide differences of opinion among the interests seeking an agreement, that for a time seem to be almost insurmountable? We are confident that there will be agreement soon. We feel that peace, together with a league of nations, will be accomplished. There are few indeed who deep down in their hearts do not desire a harmonious working agreement among the nations of the world. We entered the war to make the world better. Let us continue this spirit. The Peace Conference is in strong hands. It is in wise hands. Let us accept as a foregone conclusion that when we have the actual terms of peace and the Charter of the League of Nations we will find them to our liking. That there will be some sacrifices goes without saying. That other nations will also have to make sacrifices is apparent. We have already made a tremendous sacrifice in the men who will never return from France. Let us not forget that the power to accept sacrifices is the hallmark of character.

If we grant that the outcome is to be justice in large measure to all, then what can we do now to prepare for the immediate future? The answer to this is clear. Let every individual, company, and corporation *resume work*. Accelerate the wheels of industry. It is not a time to mope and question and say "Let the other fellow do it." Do not wait for your neighbor to act. Begin at once.

Waiting for the fall in prices has slackened the efforts of many. Why wait longer? Prices have fallen and some may fall still further, but there are markets just ahead of us. It is up to us to perfect our organization if we are to reap the full benefit of the trade that awaits us.

There is a certain succession in the order of business. A basic commodity passes through a number of hands and through different manufactories before the salesmen can confidently go forth to sell the finished product. The success of the salesmen means the vitalizing of all the industries, from mine to consumer.

The signing of the armistice started a commercial revolution. It was, however, only a revolution in kind of product manufactured and sold. In place of war products we must substitute the products used in normal times. The transition has indeed been a period of uncertainty. But is there any reason for continuing the transition indefinitely?

Is there not the same power of organization existent now as when we sent more than two million men across the Atlantic? That was not many months ago. A fraction of that energy will start the salesman out on his course again and cause the succession of industrial establishments, from retailer down to the mine, to resume.

A fraction of the courage that broke the Hindenburg line, applied to our industrial and commercial problems, will speedily win for us a prosperity that will absorb every pound of metal produced and find a job for every soldier returned from the war.

Nature and Uses of Capital in Mining

WE ARE indeed fortunate in being able to present to our readers such an excellent paper on the nature and uses of capital in mining as appears in this issue of the *Journal*. J. R. Finlay is a clear thinker and an illuminating writer. There is much in mining finance that is not generally understood, and those who are able to write in an informative way on this subject seldom attempt to do so.

The equitable taxation of mines, both by the states and by the Federal Government, is an intricate subject, and, though there has been a great deal of discussion on mine taxation, and many articles on the subject have been printed in the last decade, there is still much that can be done in formulating taxation laws which will make it possible for mining enterprises to pay their fair share toward the common weal, and at the same time enable the industry to prosper.

That mining enterprises are uniformly remunerative is a mistaken idea. This is true of a relatively small proportion only. A high degree of technical skill is required both in the operation of and in financing a mining project. Before development can be started there must be accurate information of the existence and extent of orebodies of sufficient size and metallic content to warrant attention. As Mr. Finlay says, the bonanza ore deposits are the spectacular accidents of mining, and receive far more weight and influence public opinion to a greater extent than they should. The mining industry depends largely upon mines that bring only a moderate return upon the capital invested. Nevertheless, it is the possibility of discovering a rich deposit or of developing a mine which will bring in more than the ordinary returns capital might be expected to earn that furnishes the incentive for men to go down into mines and to pioneer new country.

Mr. Finlay, though recognizing, as does every mining man, that the mining industry should bear its proper share of the expense of government in proportion to its income and profits, points out that the industry is exposed to the confiscation of its capital under the guise of "income" and "excess profits." This can come about only through misunderstanding of the significance of capital, income, and present value as applied to mining enterprises. Mr. Finlay's conclusions that the capital in question is the present value which could be realized from the liquidation of an enterprise, through normal commercial transactions; that profit is a fair interest upon the capital, and that, in the case of a property like a mine—in which a profit can be made only by using up its physical resources—income is never wholly profit, are essentially sound, and will receive substantial recognition.

Doing It Now

THE greatest deterrent to success—what is it? The neglect of those little details that take up time, attention, and thought, not because they amount to anything but because they are allowed to accumulate. Too often we keep putting them off. We are inclined to deride the Spanish word *mañana* when it is translated into "Never do today what you can put off till tomorrow," but we are, all of us, guilty of neglecting to finish the little jobs when they arise. Trying to avoid "doing it now" has led to many a failure—for tomorrow never comes.

The Fifth Liberty Loan is one of the little details that we must get off our minds without wasting time. No good is to be achieved by discussing it or even talking about it. We should take immediate and final action. The matter is absurdly small, and simple, and unimportant, this request from our Government for a mere loan, when we compare it with the glorious achievements of our men on land and sea and with their heroic sacrifices.

The Loan must be subscribed, and the nation's debts and obligations paid. For those who mourn, and for the maimed in mind and body, our sympathy, however deep and sincere, is impotent, for we can do nothing adequate. But we can see to it that the Loan goes "over the top." So let's finish the job. It *must* be finished. It *will* be finished; and it might as well be finished early. While we remain hesitant we waste time and energy that we should be using for the real work of reconstruction.

The war wasn't won by wobblers in thought or action. Let's all "do it now!"

Prosperity Impending, Not Depression

AT THE annual meeting of the United States Steel Corporation Judge Gary said in his usual illuminating way:

> "I have been accused of being more or less optimistic, but I am never so optimistic as to shut my eyes to possible danger and facts. All I can say is that any man who believes that this country is going into bankruptcy or has embarked upon a period of depression which will end in disaster, or that in the near future we will enter into such a period of demoralization, is a man who does not possess himself with the facts and figures."

It is one of the signs of the times that doubts should be expressed as to the financial stability of our country. There is a curious pessimism that attends any great transition such as is now taking place. We have our mines. We have our ores. We have our smelteries. We have our factories. We have an excellent force of skilled workers. We can see our markets ahead of us. Why should there be any doubt as to the present or the future? It is not Judge Gary's optimism that enables him to see so clearly ahead of him. It is common-sense.

Judge Gary goes on to say:

> "The war is over. We want peace between capital and labor, between competitors, between industries and the Government and with all the world. Whether we succeed in this laudable ambition will depend upon everybody doing his part and working together, from the ordinary citizen and laborer up to the more important Government officials. If we will do this, who can question the claim that the United States is bound to be the most prosperous and progressive nation on the globe?"

This is sound advice. Let everyone do his part, from lowest to highest. The final result is the outcome of the successful accomplishment of each individual task. What we want most of all is agreement between all factions, and the speeding up of the wheels of industry. Prosperity is almost within our grasp. Discussion and argument may well be postponed. Let action take their places.

Iron-Ore Taxation in Minnesota

TAXATION of the mineral wealth of Minnesota was initiated in 1881 with the enactment of a law providing a tax of 1c. per ton on all iron ore, coal, and copper ore found in the state. This remained in force and was the only tax on iron ore until 1896, when an assessment, based upon a valuation of $60,000,000, was made against the mining properties, after a careful investigation by the board of equalization and control. During the ten years following, this assessment was increased, until in 1906 the valuation had reached $80,000,000. The state tax commission, established in 1907, raised the assessable valuation of ore lands to $180,000,000, and during 1918 the valuation in St. Louis County, which contains the great mines of the Mesabi, was $275,195,453. The proposal to exact an additional impost, a super-tax, to be levied on the iron ore produced, which was introduced during the last session of the State Legislature, after previous unsuccessful attempts on the part of its supporters, has again been defeated, and it is hoped that it may not be revived in subsequent sessions.

Mining men are in no way different from other business men as to their manner of conducting commercial enterprises. The mining industry is operated along broad lines, and, as in any successful business, allowances must be made for a fair return on capital invested. However, mining in all of its branches has appealed to many, unfamiliar with its processes, as a "get-rich-quick" proposition, and the judgment of legislators too often has been biased because of this too prevalent fallacy.

Minnesota, in addition to its mineral wealth, derives immense capital from agriculture, which flourishes according to the productivity of the soil and the activity of the farmer. In contradistinction to mining, which leads to depletion, farming begets an increase in the productivity of the locality. But the depletion, argues the farmer, is a "vanishing heritage"; hence the desire to grasp the golden opportunity and make the most of the natural resources while they last. Possibly some strength might have been added to the argument for the increased tax had the creation of a sinking fund been considered, but the proposal to place the increased income, derived from such a tax, in the general fund undeniably reflects on the sagacity of the advocates of the super-tax.

Primarily, little thought is given by the projectors of tonnage taxes to the pioneer work done in mining. Ore extraction by steam shovel may be regarded as highly profitable when viewed from the bank of an open pit; the flowing sweep of the steam-shovel dipper into the closely packed bank, the dropping of the load into

the ore car, and the repetition of these operations, may be conducive to thoughts along socialistic or communistic lines, but it is but just to consider, at the same time, the preliminary labor and expense which have made all this possible. The stripping of overburden is no easy task, nor inexpensive one, and following the removal of "steam-shovel ore" is the painstaking work of "cleaning up" the pit and removing the orebody, both of which operations involve consideration of a mass of detail and often a complication of mining methods.

Underground mining on the Minnesota ranges is by no means a cheap or simple operation, and the increasing costs of labor and supplies have done much to decrease the narrow margin of profit made by the operator during the last few years. By the introduction of improved methods and machinery, open-pit and underground miners in Minnesota have been able to hold their own, but this they cannot continue to do if they are hampered by the imposition of an unfair tax.

In the article "Iron-Ore Super-Taxation in Minnesota," which appears in this issue, D. E. Woodbridge advances a masterful argument to the controversy on super-taxation. Minnesota is placed in competition with several of the other great iron-ore districts of the world, and, although occupying a strong economic position at present, the confiscation of fairly earned profit, in the form of an unjust tax, would mean the surrendering of that position.

BY THE WAY

Some of the men one meets in Virginia City are not only fellows of infinite jest, but also of such an agreeable disposition that it is pleasant to have them around, said Dan De Quille in "The Big Bonanza."

"Do you know Mr. Popper?" asked a barroom proprietor of one of his customers.

"I have heard of him," said the customer, "but I don't know that I ever met him."

"No?" said the other. "Well, you ought to make his acquaintance. He's a nice agreeable gentleman. I never saw him before last night, when he came in here about 12 o'clock and took a drink. He is a man who makes himself at home with you at once. Why, he had hardly been in here five minutes before he drew out his six shooters and began shooting holes through the pictures, the lamp and other little notions about the place, just as familiarly as though he and I had been boys together. Nothing cold and distant about him! He's a charming fellow!—charming!"

The State Historical Society is now the possessor of the gold nugget that caused the stampede to Alder gulch back in the early '60s, and resulted in the settlement and development of the State of Montana, says the *Wallace* (Idaho) *Miner*. The nugget was presented to the society by Mrs. Granville Stuart. It still reposes in the old buckskin purse in which it was placed by Mrs. Stuart's brother-in-law, James Stuart, when he picked it up on Gold Creek, just west of the main ridge of the Rockies, on May 21, 1862. Following that discovery, gold seekers poured into the state, found the rich placers in Alder gulch, founded Virginia City, and the state was born. Relating to the discovery, Mr. Stuart's diary says: "May 21, 1862. Clear and cool, west wind. Cleaned up sluice of about $22, half of this amount in one nugget. This is the first nugget found here, all the gold being rather fine. This piece is half quartz and worn smooth by glacial action. There may be quartz ledges here."

"I 'ave 'ere, m'son, w'ot's nawn in financial circles as a prospectus, an', dam-me, it do my 'eart good to see tha charitableness o' these 'ere promoters," said Cap'n Dick. "This 'ere letter, firs' of h'all, states a chap is loosin' tha h'opportunity of a lifetime if 'e does'nt read un. So 'ere we are: The Rooter H'oil an' Gas Company, Bo'okus, Texas, 'as 'oldin's coverin' 'alf tha state, an', dam-me, on she gaws like one o' these 'ere fairy stories. Trouble is, m'son, tha letter speaks o' these 'ere famous gushers, an' man never naws w'ether un means tha promoters or the h'oil wells. Then 'ere's w'ot come with tha letter—a gert yellow sheet with a 'andsome map coverin' 'alf o' one side. W'ot's think on un? These 'ere 'aystack-lookin' things scattered raound h'art tha h'oil wells, a-gushin' forth. 'Ere's tha h'expert's h'opinion, an' 'e calls your special attention to tha fac' that 'e 'as made a personal study o' tha development h'all araoun' tha 'oldin's. Wonnerful, m'son, wonnerful. But, min' you, tha h'only guarantee that thee 'as is that tha company's h'affairs will be 'andled in a fair manner, an' dam-me, I 'as no doubt o' that. Las' of h'all is tha 'sign 'ere' square, tucked away so thee can't see un 'till thee 'as read tho 'ol wondrus story. An', dam-me, son, isn't un some beauty? 'Ave I bought some? No, m'son; thee's forgetin' baout these 'ere Victory Notes."

The pessimist is not needed in the mining game, nor, for that matter, is the optimist, unless he has the brains and the push to make his optimism good. Push will carry a man over all obstructions, it will level mountains, it will bridge canyons, it will make the impossible possible, it will convert the can't-be-done to the can-be-done. Berton Braley* says of this minority of the human race:

There's a thousand "Can't-be-done-ers"
For one who says "It can!"
But the whole amount of deeds that count
Is done by the latter clan.
For the "Can't-be-done-ers" grumble,
And hamper, oppose and doubt,
While the daring man who says, "It can!"
Proceeds to work it out.

There isn't a new invention
Beneath the shining sun,
That was ever wrought by the deed or thought
Of the tribe of "Can't-be-done."
For the "Can't-be-done-ers" mutter
While the "Can-be's," cool, sublime,
Make their "notions" work till the others smirk.
"Oh, we knew it, all the time!"

Oh, the "Can-be's" clan is meager,
Its membership is small,
And it's mighty few see their dream come true
Or hear fame's trumpet call;
But it's better to be a "Can be,"
And labor and dream and—die,
Than one who runs with the "Can't-be-done's"
Who haven't the pluck to try!

*Bessemer Monthly, January, 1919.

The Mining Index

This index is a convenient reference to the current literature of mining and metallurgy published in all of the important periodicals of the world. We will furnish a copy of any article (if in print) in the original language for the price quoted. Where no price is quoted the cost is unknown. Inasmuch as the papers must be ordered from the publishers, there will be some delay for the foreign papers. Remittance must be sent with order. Coupons are furnished at the following prices: 20c. each, six for $1, 33 for $5, and 100 for $15. When remittances are made in even dollars, we will return the excess over an order in coupons, if so requested.

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10782—MANITOBA—Northern Copper Country Development. J. A. Campbell. (From a pamphlet entitled Manitoba's Northland, published Nov., 1918; 3¼ pp., illus.)

10783—ONTARIO—Mineral Developments in N. W. Ontario. Arthur L. Parsons. (Ann. Report, Ont. Bureau of Mines, 1918; 15½ pp., illus.)

GOLD AND SILVER—GEOLOGY

10784—MANITOBA—The Northern Manitoba Mineral Belt. J. A. Campbell. (From a pamphlet entitled Manitoba's Northland, published Nov., 1918; 6 pp., illus.)

10785—MANITOBA—The Rice Lake Gold Area. C. A. Bramble. (From a pamphlet entitled Manitoba's Northland, published Nov., 1918; 7 pp., illus.)

10786—NEW ZEALAND—Notes on the Geology of the Murchison District. J. Henderson. (New Zealand Journ. of Sci. and Tech., Mar., 1918; 4½ pp.)

10787—QUEENSLAND—Mount Peter Goldfield. H. I. Jensen. (Queensland Govt. Min. Journ., Feb. 15, 1919; 2⅝ pp.) 60c.

GOLD AND SILVER—GENERAL

10789—BRITISH COLUMBIA—Revelstoke Mining Division. E. A. Haggen. (Min. and Eng. Rec., Dec. 31, 1918; 13 pp., illus.) 20c.

10790—COLOMBIA—The Guamoco District of the Republic of Colombia—II. S. Ford Eaton. (Eng. and Min. Journ., Apr. 5, 1919; 4¾ pp., illus.) 20c.

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10793—RAND MINING in 1918. A. Cooper Key. (Eng. and Min. Journ., Apr. 19, 1919; 2 pp.) 20c.

10794—SAMPLING PRACTICE at Independent Mill. Claude T. Rice. (Eng. and Min. Journ., Apr. 12, 1918; 3½ pp., illus.) 20c.

10795—SOUTH AFRICA—The Mineral Industry of South Africa and Its Future. P. A. Wagner. (So. Afr. Min. Journ., Jan. 11, 18, 25 Feb. 15 and 22, 1919; 6½ pp.)

IRON ORE DEPOSITS, MINING, ETC.

10796—AUSTRALIAN IRON ORE RESOURCES. (Min. Mag., Mar., 1919; 6½ pp.) Information from official sources. 40c.

10797—CANADA—Iron Deposits on the Belcher Islands, Hudson Bay. E. S. Moore. (Bull. Can. Min. Inst., Feb., 1919; 9½ pp., illus.)

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10807—HIGH SPEED STEELS, Specifications for. R. Poliakoff. (Iron Age, Mar. 27, 1919; 2½ pp.) 20c.

10808—MANGANESE ALLOYS—The Use of Manganese Alloys in Open-Hearth Steel Practice. Samuel L. Hoyt. (U. S. Bureau of Mines, War Minerals Investigations Series, No. 11, 1918; 17 pp.)

10809—SMELTING—A New Method for the Smelting of Iron Ores. Jas. W. Moffatt. (Can. Min. Journ., Apr. 2, 1919; 4 pp.) 20c.

10810—SPIEGELEISEN—Production of Spiegeleisen in Blast Furnaces. P. H. Royster. (U. S. Bureau of Mines, War Mineral Investigations Series, No. 6, 1918; 18½ pp.)

10811—UNITED STATES STEEL CORPORATION. (Eng. and Min. Journ., Apr. 19, 1919; 1¾ pp.) Abstract of annual report. 20c.

LEAD AND ZINC

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OTHER METALS

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10816—MANGANESE—Electric Smelting of Domestic Manganese Ores. H. W. Gillett and C. E. Williams. (U. S. Bureau of Mines, War Mineral Investigations Series, No. 10, 1918; 44 pp.)

10817—MANGANESE—Problems Involved in the Concentration and Utilization of Domestic Low-Grade Manganese Ore. Edmund Newton. (U. S. Bureau of Mines, War Minerals Investigations Series, No. 9, 1918; 19 pp.)

10818—MANGANESE—The Manganese Ores of the Cairns District. H. I. Jensen. (Queensland Govt. Min. Journ., Feb. 15, 1919; 1¼ pp.) 60c.

10819—NICKEL—Pulverized Coal in Blast Furnaces at Plant of International Nickel Co. W. L. Wotherspoon. (Can. Min. Journ., Feb. 5, 1919; 1 p.) 20c.

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10822—QUICKSILVER—Fume and Other Losses in Condensing Quicksilver from Furnace Gases. L. H. Duschak and C. N. Schuette. (Tech. Paper 96, U. S. Bureau of Mines, 1919; 28¼ pp., illus.) 20c.

10823—QUICKSILVER—Our Mineral Supplies. F. L. Ransome. (Bull. 666-FF, U. S. Geol. Surv.; 8¼ pp.)

10824—RADIUM—The Radium Industry and Reconstruction. John S. MacArthur. (Eng. and Min. Journ., Apr. 5, 1919; 1½ pp.) Abstract from "Min. Journ." 20c.

10825—TIN—Ancient Tin Mines of the Transvaal. Max Baumann. (Jour. Chem., Met. and Min. Soc. of So. Afr., Feb., 1919; 12½ pp., illus.) 60c.

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NON-METALLIC MINERALS

10827—FLUORSPAR—Kentucky Fluorspar Mining. E. V. Rawn. (Iron Age, Mar. 27, 1919; ¾ p.) 20c.

10828—GRAPHITE—Preliminary Report of an Investigation Into the Concentration of Graphite from Some Ontario Ores. (Can. Min. Journ., Mar. 26, 1919; 9 pp.) 20c.

10829—MAGNESITE and Dolomite in Australia and New Zealand. P. G. Morgan. (New Zealand Journ. of Sci. and Tech., Vol. I, No. 6, 1918; 14 pp.)

10830—MAGNESITE on the Island of Margarita, Venezuela. Charles F. Z. Caracristi. (Eng. and Min. Journ., Apr. 12, 1919; 3 pp.) 20c.

10831—MAGNESITE MINING at Hemet, Calif. (Min. and Oil Bull., Mar., 1919; 2¼ pp., illus.) 20c.

10832—NEW ZEALAND—Commercial Uses of New Zealand Minerals (Chiefly Non-metallic) and Rocks. P. G. Morgan. (New Zealand Journ. of Sci. and Tech., Jan., 1918; 6 pp.)

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10834—SILICA MATERIALS—High-Grade Silica Materials for Glass, Refractories and Abrasives. R. J. Colony. (N. Y. State Museum Bull., Nov. and Dec., 1917, published in 1919; 29 pp., illus.)

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PETROLEUM AND NATURAL GAS

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10839—MONTANA—Oil and Gas Geology of the Birch Creek-Sun River Area, Northwestern Montana. Eugene Stebinger. (Bull. 691-E, U. S. Geol. Surv., 1918; 35½ pp.)

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10845—NEW ZEALAND—Notes on the Geology and Mineral Occurrences of the Wakamarina Valley. J. Henderson. (New Zealand Journ. of Sci. and Tech., Jan., 1918; 5 pp.)

10846—NEW ZEALAND—Notes on the Geology of the Waikato Valley Near Maungatautari. J. Henderson. (New Zealand Journ. of Sci. and Tech., Jan., 1918; 4½ pp.)

10847—NEW ZEALAND—The Geology of the Te Kuiti District, With Special Reference to Coal Prospects. J. Henderson. (New Zealand Journ. of Sci. and Tech., Mar., 1918; 4 pp.)

10848—ONTARIO—Ogahalla to Collins on the National Transcontinental Railway. Percy E. Hopkins. (Ann. Report, Ont. Bureau of Mines, 1918; 13 pp., illus.)

10849—UTAH—Relation of Ore Deposits to Thrust Faults in the Central Wasatch Region, Utah. B. S. Butler. (Econ. Geol., Mar.-Apr., 1919; 5½ pp., illus.) 60c.

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10850—BRITISH COLUMBIA—Mineral Production of British Columbia for 25 years, 1893-1918. (Min. and Eng. Rec., Jan., 1919; 28½ pp., illus.) 60c.

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10852—CALIFORNIA—A Trip to Calaveras County, California. Leroy A. Palmer. (Salt Lake Min. Rev., Feb. 28, 1919; 4½ pp., illus.) 20c.

10853—CONCRETE—The Use of Concrete in Underground Works. (Chem., Eng. and Min. Rev., Feb. 5, 1919; 2½ pp., illus.) Describes work done by Wallaroo & Moonta Mining and Smelting Co. 40c.

10854—CO-OPERATION AMONG SMALL MINES with a View to Increasing Efficiency of Operation. R. W. Brigstocke. (Bull. Can. Min. Inst., Mar., 1919; 3½ pp.)

10855—DUST—The Effects of Dust Inhalation. J. S. Haldane. (Journ., Chem., Met. and Min. Soc. of So. Afr., Oct., 1918; 8½ pp.) Continued discussion of paper previously indexed.

10856—EXPLOSIVES. Robert S. Lewis. (Min. and Sci. Press, Feb. 22, 1919; 8½ pp., illus.) Notes on the leading explosive compounds in use and suggestions regarding their application. 20c.

10857—ITALY—L'industria Mineraria e Metallurgica Toscana. Gaetano Castelli. (Rassegna Mineraria, Oct., 1918; 5 pp.)

10858—ONTARIO—Statistical Review of the Mineral Industry of Ontario for 1917. Thos. W. Gibson. (Ann. Report, Ont. Bureau of Mines, 1918; 76½ pp., illus.)

10859—ORE RESERVES—Application of the Theory of Probability in the Determination of Ore Reserves. G. A. Watermeyer. (Journ. Chem., Met. and Min. Soc. of So. Afr., Jan., 1919; 11½ pp.) 60c.

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10865—TAXATION—Principles of Taxation. (Eng. and Min. Journ., Mar. 29, 1919; 2 pp.) Abstract from an address by Prof. E. R. A. Seligman before N. Y. Section, Min. and Met. Soc. of America. 20c.

10856—TIMBER-HANDLING PLANT—Economical Timber-Handling Plant at an Anthracite Mine. Ralph A. Smith. (Coal Age., Feb. 20, 1919; 2 pp., illus.)

10857—VENTILATION—Mine Ventilation in the Coeur d'Alenes. Robert N. Bell. (Eng. and Min. Journ., Apr. 5, 1919; 2¾ pp.) From report of State Mine Inspector. 20c.

METALLURGY—GENERAL

10858—ACCIDENTS at Metallurgical Works in the United States During 1917. Albert H. Fay. (Tech. Paper 215, U. S. Bureau of Mines; 18½ pp.)

10859—AIR-VOLUME REGULATION in Smelting and Refining Furnaces. C. H. Smoot. (Eng. and Min. Journ., Apr. 12, 1919; 3 pp., illus.) 20c.

10860—BRASS—Corrosion of Brass in Sea Water. Paul T. Bruhl. (Chem. and Met. Eng., Mar. 1, 1919; ¾ p.)

10861—DECOMPOSITION of Metals—I. Col. A. I. Krynitzky. (Chem. and Met. Engr., Mar. 15, 1919; 5½ pp., illus.) A critical review of various theories which have been advanced from time to time to explain the so-called "disease of metal."

10862—ELECTROSTATIC PRECIPITATION—Notes on Electrostatic Precipitation. H. D. Braley. (Advance Copy, Am. Electrochem. Soc., Apr., 1919; 44 pp., illus.)

10863—SAFETY—Army Gas Masks in Sulphur-Dioxide Atmospheres. A. C. Fieldner and S. H. Katz. (Eng. and Min. Journ., Apr. 19, 1919; 3 pp., illus.) 20c.

SAMPLING AND ASSAYING

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10866—RED LEAD—Notes on the Chemical Analysis of Red Lead. W. F. Edwards. (Chem. and Met. Eng., Jan. 1, 1919; 2 pp.)

FUELS

(See also "Petroleum and Natural Gas"

10867—BRIQUETTES—Some Notes on the Manufacture of Fuel Briquettes. E. H. Robertson. (Trans. Min. and Geol. Inst. of India, Sept., 1919; 13½ pp.)

10868—CONSERVATION—Saving Coal in Steam Power Plants. (Tech. Paper 217, U. S. Bureau of Mines; 8 pp.) Reprint of Eng. Bull. No. 2, of U. S. Fuel Administration. 20c.

10869—LIGNITE—Combustion Experiments with North Dakota Lignite. Henry Kreisinger, C. E. Augustine and W. C. Harpster. (Tech. Paper 207, U. S. Bureau of Mines, 1919; 39½ pp., illus.)

10870—STORAGE—Deterioration in the Heating Value of Coal During Storage. G. Cecil Jones. (Journ. Soc. of Chem. Ind., Feb. 28, 1919; 1 p.)

10871—U. S. FUEL ADMINISTRATION—Distribution of Coal Under U. S. Fuel Administration. J. D. A. Morrow. (Bull. A.I.M.E., Mar., 1919; 4½ pp.) 40c.

MINING AND METALLURGICAL MACHINERY

10872—BOILER-WATER TREATMENT. (Tech. Paper 218, U. S. Bureau of Mines, 1919; 8 pp.) Reprint of Engineering Bull. No. 3, U. S. Fuel Administration. 40c.

10873—DRILLS—Hammer Drills, Their History, Design and Operation. Henry S. Potter. (Journ. So. Afr. Instn. of Engrs., Nov.-Dec., 1918, Jan. and Mar., 1919; 20 pp., illus.)

10874—MOTORS—Cooling of Electric Motors, With Special Reference to Totally Enclosed Machines. P. A. Mossay. (Trans. Min. Inst. Scot., Vol. XI, Pt. 8, 1919; 14½ pp., illus.)

10875—RESCUE APPARATUS—Uses and Limitations of Respirators, Gas Masks and Oxygen Apparatus. (Eng. and Min. Journ., Mar. 15, 1919; 1¼ pp.) 20c.

10876—STEAM ECONOMICS in Simple Terms. S. A. Worcester. (Eng. and Min. Journ., Mar. 29, 1919; 2 pp.) 20c.

10877—WELDING—The Development of the Oxy-Acetylene Welding and Cutting Industry in the United States. Henry Cave. (Engineering, Feb. 7, 1919; 2¾ pp., illus.) Paper before Instn. of Mech. Engrs., Feb. 7, 1919. 40c.

INDUSTRIAL CHEMISTRY

10878—AMMONIUM NITRATE—The United States Ammonium Nitrate Plant, Perryville, Md. (Atlas Powder Co.). (Chem. and Met. Eng., Apr. 1, 1919; 6½ pp., illus.

10879—COAL BY-PRODUCTS—Coal: Its Value as a Raw Material for Distillation Products. J. A. Wilkinson. (So. Afr. Journ. of Ind., Dec., 1918, and Jan., 1919; 24 pp.)

INDUSTRIAL CHEMISTRY

10880—NITRATE—Muscle Shoals Nitrate Plant. Andrew M. Fairlie. (Chem. and Met. Eng., Jan. 1, 1919; 10 pp., illus.)

10881—NITROGEN COMPOUNDS—The Production of Nitrogen Compounds. Jack P. Montgomery. (Chem. Engr., Feb., 1919; 4½ pp.)

10882—NITROGEN FIXATION FURNACES. E. Kilburn Scott. (Advance copy, Am. Electrochem. Soc., Oct., 1918; 32 pp., illus.)

10883—POTASH—Separation of Potash Salts. H. P. Bassett. (Chem. and Met. Eng., Jan. 15, 1919; 1½ pp.)

10884—SODIUM SALTS in 1917. Roger C. Wells. (Mineral Resources of the U. S., 1917, Part I; 36½ pp.)

10885—TANKS—Storage Tanks Made of Reinforced Concrete. F. W. Frerichs. (Chem. and Met. Eng., Mar. 1, 1919; 5 pp., illus.)

10886—SOUTH AFRICA—Inorganic Chemical Industries. I, Caustic Soda, Common Salt, Niter Cake and Glauber Salt. M. Rindl. (So. Afr. Journ. of Ind., Oct., 1918; 10 pp.)

10887—SULPHURIC ACID—Continuous Sulphuric Acid Sampler. S. A. Ionides. (Chem. and Met. Eng., Jan. 1, 1919; ¾ p.)

MATERIALS OF CONSTRUCTION

10888—CEMENT in 1917. Ernest F. Burchard. (Mineral Resources of the U. S., 1917, Part I; 24¾pp.)

10889—CONCRETE as a Chemical Engineering Material. Maximilian Toch. (Chem. and Met. Eng., Mar. 1, 1919; 2 pp.) Address before Am. Inst. of Chem. Engrs., Jan. 16, 1919.

MISCELLANEOUS

10890—BRITISH COLUMBIA—Mining Convention at Vancouver. (Eng. and Min. Journ., Apr. 12, 1919; 6 pp.) Account of proceedings of Internat. Mining Convention, held Mar. 17. 20c.

10891—BURMA—The Development of the Trade of Burma. A. S. Judge. (Bull. Imperial Inst., July-Sept., 1918; 35½ pp.)

10893—LABOR—Development of Americanization Project. Charles H. Paull. (Industrial Management, Mar., 1919; 4¼ pp., illus.) 40c.

10894—LABOR—GROUP INSURANCE for the Industrial Worker. Edward E. Rice. (Industrial Management, Mar., 1919; 3 pp.)

10895—LABOR—Reducing the Cost of Disability. Douglas C. McMurtrie. (Iron Age, Feb 6, 1919; 1½ pp.)

Personals

W. A. McGonagle has returned from a trip in California.

Harry J. Wolf visited mining properties in the Cripple Creek district recently.

C. D. Keading, general manager, has returned to the Dome mines at Porcupine.

F. F. Sharpless leaves for Sonora, Mexico, on May 3 on professional business.

E. J. Carlyle is now with the British America Nickel Corporation at the Murray mine.

Robert Bryce, after examination of a property in Nova Scotia, has returned to Toronto.

Maj. Arthur S. Dwight, formerly of the 11th Engineers, is expected from France within the next few weeks.

E. P. Mathewson was in Butte recently on a periodical tour of inspection of properties which he represents.

E. L. Bruce, of the Geological Survey of Canada, is giving a series of lectures at the University of Manitoba.

Fred Flink has returned from overseas service and resumed his position as mining engineer at the Crosby mine, Nashwauk, Minn.

Walter Harvey Weed is consulting engineer for the Crystal Copper Co., which is operating the Goldsmith mine, at Walkerville, Mont.

Lieut. R. H. Burrage, formerly of the 27th Engineers, has been ordered to Camp Humphreys as instructor in the engineering school.

A. F. Coyne, president and managing director of Northern Production Co., and **G. L. Stebbing** were recently in Toronto en route to England.

R. E. McConnell has just returned from Germany, and is on his way to Los Angeles, Calif., where he will resume his mining engineering practice.

George C. Mackenzie resigned his position with the Mines Branch, Ottawa, and became general manager of Electric Steel and Engineering Co. on Mar. 14.

William Gibson, former superintendent of the Butte & Zenith Mining Co., Butte, has succeeded Cecil Hull as superintendent of the Goldsmith mine at Walkerville, Mont.

Fred W. Denton, consulting engineer for the Copper Range properties, and now residing in Boston, is in Houghton for an extended visit to the mining properties.

Victor Ziegler, of the Geology and Mineralogy Department of the Colorado School of Mines, has tendered his resignation, to be effective at the close of the school year.

R. G. Wayland, formerly superintendent and chief engineer for the Alaska Treadwell Mining Co., has been appointed chief engineer for the Homestake Mining Co. at Lead, S. D.

Bernard V. Matson, of Deadwood, S. D., has been appointed superintendent of the refining department of the U. S. Mint at Denver. Until a few weeks ago Mr. Matson was employed in the Government Mint at New York City.

H. H. Armstead will be permanently situated in Seattle, being associated with **C. V. Bob** and **L. A. Levensaler** in the Standard Snow Motor Co. for the manufacture and introduction of these motors in Alaska, Siberia and certain sections of the United States.

John Black, manager of the Flin Flon Syndicate, **John Hammell**, of the original owners, **Prof. R. C. Wallace**, and **J. A. Campbell**, M. P., of The Pas, were part of a delegation which waited upon the government in reference to the New Manitoba railway development.

Erle Dudley has resumed his position as construction superintendent for the Bunker Hill & Sullivan Mining and Concentrating Co. after serving for 15 months as captain with the U. S. Engineers, most of which time was spent in France on organization and construction work.

C. M. Weld, on May 1, returns from his war work as assistant executive of the War-Minerals Investigations, Bureau of Mines, Washington, and will resume his former consulting practice in New York. His office will be temporarily at No. 2 Rector St., and his office staff will be as before.

Jay A. Carpenter has returned to Tonopah after eight months' absence as superintendent for the Nevada Wonder Mining Co. at Belmont, Nev. He will open an office as consulting engineer, specializing in the management of small properties. Mr. Carpenter will take charge immediately of the work at the Ben Hur and Keystone properties.

Edwin C. Holden, general manager of the Davison Sulphur and Phosphate Co. since its inception, having brought the Carlota mine, in the Province of Santa Clara, Cuba, to a shipping stage, is moving May 1 to the headquarters of the company in Baltimore. **Chester A. Fulton**, superintendent, succeeds him in the active management in Cuba.

William H. Schacht, general manager of the Copper Range mines, recently delivered a lecture to students at the Michigan College of Mines on the steam regenerating system in use at the Champion copper mine. **James MacNaughton**, vice-president of the Calumet & Hecla, will deliver a lecture during this week regarding practical improvements in underground haulage.

Richard B. Moore, of the U. S. Bureau of Mines, has been voted the Edward Longstreth Medal of Merit by the subcommittee on literature of the Franklin Institute. The medal was awarded for Mr. Moore's biography and review of the work of Sir William Ramsay, which was described by the subcommittee as a most lucid and informing exposition of the great chemist's life and work.

Harry A. Garfield was the guest of honor at a reception and dinner given in complement to him by the executive heads of the U. S. Fuel Administration last week. William B. Symes, Jr., solicitor of the Fuel Administration, presided. Dr. Garfield was presented with a bronze reproduction of the familiar "Soldier and Miner" poster. Among the 40 guests were J. D. A. Morrow, general director of the distributing division of the Fuel Administration; M. L. Requa, general director of the oil division, and W. E. Hope.

Obituary

Clyde McKenzie, formerly connected with the Tonopah Belmont as field engineer, died recently in Tonopah, at the age of 30 years. He was graduated from the Mackay School of Mines of the University of Nevada in 1910 and began his career with the Tonopah Belmont Development Co. as draftsman, being later promoted to field engineer, until placed in charge of the Emma mine, in Colorado. Mr. McKenzie enlisted in the 27th Engineers as a private in 1918, and later was commissioned a first lieutenant in the Chemical Warfare Service, receiving his discharge in January, 1919.

William S. Rheem, president of the Standard Oil Co. of California, recently died suddenly at Santa Cruz, Calif., of heart disease. Mr. Rheem succeeded D. G. Schofield, who died two years ago. He had been with the company for the last 25 years, beginning his career as an expert refiner in one of the company's Eastern plants. He went to California in 1900 from Whiting, Ind., and established the Standard refinery at Port Richmond, later becoming secretary and vice-president of the company in California. He is survived by his widow and three sons. Mr. Rheem was 57 years old.

Verner Z. Reed, who was a member of the Special Mediation Commission appointed by the President to undertake the adjustment of industrial labor troubles soon after the United States entered the war, and made a trip in 1917 of many weeks' duration through the West investigating deportations and unrest in the Arizona copper districts, and labor troubles elsewhere, died on Apr. 20 at Coronado, Calif. Mr. Reed was born in Ohio in 1863, and for many years was engaged in mining, banking, petroleum development, land reclamation, and irrigation enterprises in Colorado, Wyoming, and other states. He was a member of the Explorers' and Rocky Mountain clubs.

Societies

Engineers' Club of Northern Minnesota held a meeting on Apr. 26, when H. A. Higgins addressed the club on "Mine Accounting."

Canadian Mining Institute, Manitoba Branch, held a meeting at Winnipeg on Apr. 19, and the following officers were elected: Chairman, Dr. R. C. Wallace, The Pas; vice-chairmen, W. J. Dick, Winnipeg, and G. R. Bancroft, The Pas; secretary-treasurer, J. S. DeLury, Winnipeg; executive committee, B. S. McKenzie, G. B. Hall, E. W. Jackson, F. de Sieyes, and D. C. McArthur, Winnipeg, and Walter Neal and J. A. Campbell, The Pas. A resolution was adopted approving of what had been done by the council of the Institute to urge upon the Canadian government the employment of returned soldiers as prospectors.

Industrial News

Hatton, Klein & Holmes is a partnership recently formed between Norman Hatton, William J. Klein and S. E. Holmes for the purpose of conducting a practice devoted to general engineering, architecture, machinery lay-outs, heating and ventilating, and industrial engineering.

Sullivan Machinery Co., Chicago, announces that Lieut.-Col. George W. Blackinton, the former office manager at Denver and now serving in the American Army in France, has been recently promoted from the rank of Major and is expected to return in June, having been transferred to 353d Infantry of the 89th Division.

Charles Leroy, a Jeandelize par Conflans, Arrondissement de Briey, Meurthe et Moselle, France, an Italian engineer familiar with European mining properties, particularly those in the Bassig de Wriey section and western France, Spain and Italy, is desirous of getting in touch with American firms interested in mining, with a view toward forming a coöperative business relationship.

Traylor Engineering and Manufacturing Co., Allentown, Penn., in a circular recently issued, extends an invitation to the company's friends to visit its shops during the week of Apr. 28 and view the largest stone crusher in the world, the 60-in. Traylor "Bulldog" gyratory, built for the Michigan Limestone and Chemical Co. This crusher has two receiving openings, each 60 x 190 in., and a capacity of 2500 tons crushed stone per hour.

American Zinc, Lead and Smelting Co., with offices in St. Louis, New York and Boston, has made arrangements with the American Zinc Sales Co. to handle Azo zinc oxides. For the convenience of its increasing trade, and to facilitate shipments of L. C. L. lots of Azo zinc oxides, in Chicago and adjacent territory, the American Zinc Sales Co., with offices at 1415 Conway Building, Chicago, will act as the exclusive representative of the American Zinc, Lead and Smelting Co.'s products in this territory. A. C. Eide has been appointed manager of the Chicago office of the American Zinc Sales Company.

Chicago Pneumatic Tool Co. announces the election of Allan E. Goodhue as managing director of its English subsidiary, the Consolidated Pneumatic Tool Company, Ltd., whose offices are at 170 Piccadilly, London, the plant being in Fraserburg, Scotland. Mr. Goodhue will also be in charge of European sales. Mr. Goodhue was for a number of years connected with the sales department of the Midvale Steel Co. and Midvale Steel and Ordnance Co. in Philadelphia, Chicago, and Boston, leaving in March, 1918, to enter the service of the Government. From that time until Jan., 1, 1919, when he became connected with the Chicago Pneumatic Tool Co., he was assistant manager of the steel and raw-material section, production division, of the Emergency Fleet Corporation. Mr. Goodhue is to sail for England May 13 on the "Mauretania."

Trade Catalogs

Soot Cleaners for Boilers. Vulcan Soot Cleaner Co., Du Bois, Penn. Folder descriptive of soot cleaners for return tubular boilers, and relation of soot to efficiency.

Insulated Hangers. The Ohio Brass Co., Mansfield, Ohio. Illustrated folder describing the O-B Type S insulated hangers, allowing alignment of clamp to eliminate kinks in the wire.

Precipitation of Cyanide Solutions. The Merrill Co., San Francisco. A pamphlet on "Comments of the Technical Press on the Crowe Vacuum Precipitation Process. A New Method of Precipitation of Cyanide Solutions in Conjunction With Either the Merrill Precipitation Process or With Zinc Boxes."

Leather Belting. Charles A. Schieren Co., New York City. Catalog No. 10; 6 x 9; 40 pp.; illustrated. Descriptive of various Schieren beltings, giving price lists; table of widths and lengths of laces, hydraulic leather, waterproof cement, and belt dressings. The Lenix Drive, a device for increasing the arc of contact, is described in the last pages.

The Use of Shoveling Machines in Underground Mining. Myers-Whaley Co., Inc., Knoxville, Tenn.; 8¼ x 10¼; 20 pp.; illustrated. Bulletin descriptive of the operations of Myers-Whaley shoveling machines in metal and coal mines. Capacities in tons per shift, distributive costs and other data are given for operations under various conditions and material handled.

Nickel Copper Steel, Nicu Steel Corporation, Ltd., Box 128, Welland, Ontario; 5½ x 8; 8 pp. A pamphlet entitled "Nicu Steel," which is a high-grade alloyed steel able to stand hard usage and rough treatment. The catalogue describes "Nicu Steel" transmission shafts and gears, crank shafts, axles, springs, valve stems, rods, and similar parts. This company has a New York office at 43 Exchange Place.

New Patents

United States patent specifications may be obtained from "The Engineering and Mining Journal" at 25c. each.

Cast Iron — Manufacture of Gray Cast Iron. Walter Birkett Hamilton, Yorkshire, England. (U. S. No. 1,296,384; Mar. 4, 1919.)

Concentrator—Ore Concentrator. George W. Burnhart, Denver, Colo. (U. S. No. 1,295,267; Feb. 25, 1919.)

Concentrator—Ore Concentrator. James A. Brent, San Francisco, Calif. (U. S. No. 1,295,960; Mar. 4, 1919.)

Conveying Apparatus for Disintegrated Material. Louis Ellman, Pittsburgh, Penn., assignor to the Hagan Corp., Pittsburgh, Penn. (U. S. No. 1,296,497; Mar. 4, 1919.)

Copper—Process for Treating Ores and Metals in Reverberatory Furnaces. George Campbell Carson, San Francisco, Calif. (U. S. No. 1,296,478; Mar. 4, 1919.)

Crushing—Grinding Mill. Johan S. Fasting, Frederiksberg, near Copenhagen, Denmark, assignor to F. L. Smidth & Co., New York, N. Y. (U. S. No. 1,295,288-91; Feb. 25, 1919.)

Crushing—Grinding Mill. John Willis Garrow, Copper Cliff, Ontario, assignor of one-third to James D. Cumming and one-third to George R. Craig, Copper Cliff, Ontario. (U. S. No. 1,295,726; Feb. 25, 1919.)

Crushing—Gyratory Crushing Apparatus. Joseph E. Kennedy, New York, N. Y. (U. S. No. 1,295,757; Feb. 25, 1919.)

Crushing—Tube Mill. Johan S. Fasting, Frederiksberg, near Copenhagen, Denmark, assignor to F. L. Smidth & Co., New York, N. Y. (U. S. No. 1,295,289-90; Feb. 25, 1919.)

Desulphurizing Metal Sulphides, Process of. Arthur B. Foster, Washington, D. C., assignor to Sulphur Syndicate, Ltd., London, Eng. (U. S. No. 1,296,585; Mar. 4, 1919.)

Drill. Arthur L. Hawkesworth, Butte, Mont. (U. S. No. 1,296,078; Mar. 4, 1919.)

Drill Bits—Joint for Drill Bits and Other Purposes. Henry Haus, Pope Valley, Calif. (U. S. No. 1,296,954; Mar. 11, 1919.)

Drill Puller. Willis A. Cook, Republic, Wash., assignor of one-half to Alex. McKay, Republic, Wash. (U. S. No. 1,295,700; Feb. 25, 1919.)

Dump Car. Ernest Junghanns, Anaconda, Mont. (U. S. No. 1,297,356; Mar. 18, 1919.)

Electric Furnace. Albert E. Greene, Seattle, Wash. (U. S. No. 1,297,149; Mar. 11, 1919.)

Electric Furnace and Method of Melting Metals and Smelting Ores. Parvin Wright and Ivan B. Wright, Seattle, Wash. (U. S. No. 1,296,896; Mar. 11, 1919.)

Electric Induction Furnace. Oscar Brophy, Philadelphia, Penn. (U. S. No. 1,296,752; Mar. 11, 1919.)

Electrolysis—Apparatus for the Electric Dissolution and Precipitation of Metals. Edward R. Holden, Los Angeles, Calif. (U. S. No. 1,295,752; Feb. 25, 1919.)

Filter-Scraper Shifter (Automatic). Paul D. Sidey and Glen L. Harley, Goldfield, Colo. (U. S. No. 1,296,865; Mar. 11, 1919.)

Flotation—Process for Separating Ore Materials from Each Other. Robert S. Towne, New York, N. Y., and Frederick B. Flinn, Orange, N. J., assignors to Bubble-Column Corporation. (U. S. No. 1,295,817; Feb. 25, 1919.)

Lamp. Acetylene Lamp. Augie L. Hansen, Evanston, Ill., assignor to Justrite Manufacturing Co., Chicago, Ill. (U. S. Nos. 1,295,743 and 1,295,744; Feb. 25, 1919.)

Leaching. Process for Treating Ores. Joseph Irving, Bisbee, Ariz. (U. S. No. 1,296,523; Mar. 4, 1919.)

Oil Wells, Method of Operating. Charles A. Waitz, Rouseville, Penn. (U. S. No. 1,295,243; Feb. 25, 1919.)

Ore-Treating Apparatus. Alfred Leslie Blomfield, Denver, Colo., assignor to the Dorr Co. (U. S. Nos. 1,294,759 and 1,294,864; Feb. 18, 1919.)

Ore-Treating Apparatus. Alfred Leslie Blomfield, Denver, Colo., assignor to The Dorr Co. (U. S. No. 1,294,864; Feb. 18, 1919.)

Sample-Taking Device. Redus D. Dodds, Humble, Tex. (U. S. No. 1,295,134; Feb. 25, 1919.)

Separating Tanks, Overflow Control for. Charles Allen, El Paso, Tex. (U. S. No. 1,296,252; Mar. 4, 1919.)

Steel-Smelting Furnace. Walter G. Perkins, San Francisco, Calif., and William H. Fitch, Pittsburgh, Penn. (U. S. No. 1,295,586; Feb. 25, 1919.)

Zinc. Process of Treating Zinc Ores. Augustus P. Craft, Galena, Ill. (U. S. No. 1,295,857; Mar. 4, 1919.)

Editorial Correspondence

SAN FRANCISCO, CALIF.—Apr. 22

Consolidated Virginia and Ophir produced in excess of $17,000 in the week ended Apr. 19. Mexican mill ran 92% of the time, and crushed a total of 407 tons from Consolidated Virginia, average $30.49, and 182 tons from Ophir, averaging $27.31 per ton. Consolidated Virginia production included 29 cars from 2150 level that averaged $165 per ton, the highest-grade ore that has come from this mine in the last 25 years. Some excitement was created by this strike of ore, which showed assays as high as $2000 per ton. It is not probable that such returns will be constant. Whitman Symmes, manager, is reported to have stated that there are several places where $2000 ore can be picked out, but that this does not mean the average will hold.

Annual Report on Oil Fields by the State Oil and Gas Supervisor, R. P. McLaughlin, contains a detailed account of all field operations in California for the last fiscal year, which ended June 30, 1918. The report also sets forth the general conditions of all the fields, including distribution of ownership of proved oil lands and statistics of production by fields. Comparison of results from the various methods of shutting off water is presented, showing a wide variation in oil-field practice. The supervisor believes that the experiences of operators and a comparison of methods in the last year will result in a saving in the present year of a total of approximately $250,000 needlessly expended in the last year. Interesting facts regarding the loss resulting from drilling wells too close together are briefly set forth. The report shows advancement in caring for oil lands due to coöperation with the State Mining Bureau.

Litigation Over Patent to Roche Rock Lode, situated in the heart of the town of Grass Valley, being granted to the Golden Center of Grass Valley Mining Co., which company claims said lode by purchase and possession, may be initiated by the City Trustees of Grass Valley. A protest has been filed in the U. S. Land Office at Sacramento, Calif. When the U. S. Government granted a townsite patent in 1872 to what was then the town of Grass Valley, the owners of a number of lots and the mining claims failed to acquire townsite deeds. Some of these lands were operated as prospects or as mines for many years thereafter, and operations finally ceased. The situation remained unchanged for many years, and up to about the time that the applicant company found a producing mine—hence the application for patent to the Roche Rock lode. The point involved is whether this land was a known mine or a recognized mining possession at and prior to June 18, 1869, the date of entry of the townsite, and contains minerals of such extent as to justify expenditures for the purpose of extracting them. On Feb 15 last the Secretary of the Interior ordered the hearing. Many of the lot owners in the city are apprehensive that should a mineral patent be issued for this claim other applications will follow and mining might become general under the city; millions have already been extracted from deep-mining operations under lands not in conflict with this Roche Rock claim. The application is simply to acquire title and not to establish a precedent, although future litigation may follow as a result of such patent. With only a change in the procedure it is a case of mineral against townsite to be fought all over again, and it promises to be a long contest. The hearing is set for May 21.

BUTTE, MONT.—Apr. 26

Anaconda Copper Mining Co. is operating 11 properties out of 31 which it either owns or has under control. The production is about 55% of normal, and, roughly estimated, 5000 men are employed. The smeltery of Anaconda is running close to 60%, as it is treating some custom ore in addition to the ore from the company's properties in this city. According to reports the company is going into the manufacture of calcium carbide. At present one of the five furnaces originally built to manufacture ferromanganese for the Government is to be used, and the lime needed will be obtained from one of the quarries near Great Falls now operated by the company. First test will be to make 25 to 30 tons of calcium carbide. To handle the carbide it will be pressed and sealed in tin cans.

DENVER, COLO.—Apr. 25

Leadville Strike Situation has been one of the most serious mining problems that Colorado operators have faced in many months, because it involved the possible abandonment of a famous mining camp, great financial loss to operators and investors, and a most critical development in a local labor problem which might easily result in far-reaching and embarrassing consequences. Briefly, the situation developed under the influence of three chief factors, viz., the high cost of commodities, high wages, and low market price for metals produced. The readjustment of wages was the chief factor in the controversy, as it was clearly beyond the power of either party in the contest to vary the other factors involved. The usual contributary causes of friction between the interested parties, such as lack of diplomacy on the part of officials on both sides, or their failure to appreciate underlying reasons for the existing mutual dissatisfaction, served to obscure the real issue for a time and delay a settlement, but perhaps to less extent than is usual in such cases. On Apr. 18 Governor Shoup, accompanied by two members of the State Industrial Commission, William I. Reilly and J. C. Bell, went to Leadville in answer to an appeal from the miners. Though both operators and

miners appeared to appreciate the Governor's efforts, the operators claimed that the mines would have to close unless men could be obtained at a $3.50 minimum wage, and the miners claimed that they could not live on less than $4.50 per day. Some of the mines laid plans to pull their pumps, which greatly added to the gloom of the situation, as it was realized that if the properties were allowed to fill with water, many of them would become unworkable for a long period of time. On Apr. 20, at the beginning of the Sunday shifts, the miners of many of the large properties walked out. The principal properties affected were the Yak, Iron-Silver, Mikado, Down Town Mines, Garbutt, and Ibex. About 600 miners, engineers, and pumpmen quit work. Just prior to the walkout, some of the mines pulled their pumps in order to avoid loss of valuable equipment. The striking miners then formed a union and appointed a committee to confer with the operators' committee on a proposed compromise $4 wage scale. The situation became more hopeful, although the serious possibilities of flooding underground workings as a result of cessation of pumping operations were fully realized. On Apr. 22 the miners' committee and the operators agreed on a minimum wage of $4 a day. This represented a wage reduction of 50c. instead of $1 as originally announced by the operators in their proposed sliding scale based on the state of the zinc market. It is not yet known whether the mines will continue to operate at full capacity under the present low prices for metals. The operators entering into the agreement with the miners include the managers of the Yak, Down Town Mines, Ibex, and Garbutt groups. Some of the pumps that were pulled have not been reinstalled, and these properties are already partly flooded.

The strike was rather unusual in that it was marked by good feeling on both sides, each faction maintaining that it was willing to make every possible financial concession to keep the mines in operation. In many properties the pumps were kept working by volunteer pumpmen, the miners supplying some of the volunteers. No matter how peaceably a controversy of this character may be settled, every strike has its aftermath. In this case there will be many unemployed in Leadville, as several mines will not reopen, at least for the time being. The Mikado shaft of the Iron-Silver Mining Co. will not resume for an indefinite period, as many of the workings are under water, the pumps having been removed when the miners announced that they would strike. It is said, also, that the Greenback shaft of the Greenback Mining Co. will not resume operations. Both the Mikado and the Greenback companies have agreed to pay the existing wage scale when they reopen. The Yak, Penrose, Garbutt, and Ibex shafts will resume operations soon, but it is thought that these properties will probably reduce their working forces. During the last two weeks there has been a marked exodus of single men from the district. During the strike no attempt was made to operate the mines with outside labor, the operators agreeing that this would be a serious mistake because such a step could lead to no ultimate solution of the difficulty, and their principal concern was to keep the pumps operating at the deepest mines of the district so as to prevent disastrous flooding.

SALT LAKE CITY, UTAH—Apr. 26

The State Board of Equalization has received a statement concerning the mining properties of the Knight interests for taxation purposes which shows the following returns during 1918: Dragon Consolidated, gross yield, $374,082; deduction, $317,749; net proceeds, $56,332; valuation for taxation (three times net proceeds), $168,978. Iron Blossom, gross yield, $878,156; deductions, $771,612; valuation for taxation, $319,633. Swansea Consolidated, gross yield, $15,648; deuctions, $14,283; net proceeds, $1363; valuation for taxation, $4092. Empire Mines, gross yield, $43,247; deductions, $88,994. Colorado Consolidated, gross yield, $264,755; deductions, $288,426. Tintic Drain Tunnel, gross yield, $1083; deductions, $52,234.

High Freight Rates imposed under Government railroad management are being protested by some of the smelting companies operating in Salt Lake Valley. The complaint alleges that, though the increase was said to have been only 25%, the actual advance on smelting products amounted to 170%. Also it is pointed out that there has been a large increase in the prices of most articles of commerce, that the price of copper as fixed by the Government during the war was far below the market quotation, and that the cost of production of smeltery products had advanced more than 75%. Relief is asked as well as reparation for alleged overcharges. Coal companies, 15 in number, operating in Salt Lake, are asking a refund on alleged excess freight rates—in round numbers, $500,000—paid the Denver & Rio Grande R.R. on coal brought in from Carbon County. In the complaint, filed with the Public Utilities Commission, a refund of 35c. a ton is asked, except in the case of coal from Sunnyside and Thompsons, where the excess is given as 45c. per ton, extending over a period of two years.

WALLACE, IDAHO—Apr. 25

Employment for Returning Soldiers has up to date not proved a serious problem in the Coeur d'Alene district. It is estimated that three or four hundred have returned to this county, and, so far as can be learned, not one of them is idle who desires work. In fact, there is an actual shortage of labor for the mines, particularly experienced miners. This is probably due to the demand for labor in the agricultural districts and on the coast, and also to the fact that the rate of pay in the mines of Butte is 50c. per day above the rate here. It is believed, however, that this situation will adjust itself in a short time.

Improvement in Lead Market is indicated by the resumption of operations by the Hercules Mining Co. and the Tamarack & Custer Consolidated Mining Co., or at least that is the view taken by the Days, who control both these mines, and also the Northport smeltery. The Hercules and Tamarack mines closed down just before Christmas for a holiday of 10 days, but at the end of that period employes who returned to work were informed that the shutdown would be continued indefinitely. The Northport smeltery, which handles little if any business outside of the Day mines, closed a little later. The fact that all other lead mines of the Coeur d'Alene district continued production, although with reduced output, caused much speculation as to why the Days closed down tight, it being contrary to the Days' policy to give out any information regarding their affairs. Following the shutdown persistent rumors were circulated that the Guggenheims were negotiating for all the Day holdings, and color was given to these rumors by the arrival of William Loeb, vice-president of the American Smelting and Refining Co., in Spokane, where it was reported that he conferred with the Days. If there was any basis for these rumors, it is evident now that nothing resulted from the negotiations. A more plausible explanation of the action of the Days in closing their mines and smeltery is that the failure of the lead market following the signing of the armistice found them with a large stock of lead on hand, for which there were no buyers, and to continue production meant a steady increase in the surplus and the consequent tying up of a large sum of money. At the same time they probably considered that, as the smeltery was running on ore from their own mines, it would be the part of economy to leave the ore in the mines rather than convert it into pigs that could not be sold. Accepting the last explanation as correct, the fact that the Day mines are again active is taken to mean that the Days believe the crisis in the lead market has been passed and that a growing demand for lead may be expected which will insure profitable production.

DULUTH, MINN.—Apr. 26

The Ore-Royalty Tax Bill, which passed the Minnesota House by an overwhelming majority, has been defeated by the Senate by the close vote of 34 to 33. The bill provided for a tax of 3% on all income from ore royalties, in addition to the regular state and Federal income taxes.

Minnesota Steel Co. blast furnaces in Duluth have been reduced to an operating basis of one-third of capacity. The men are being worked on short time, in order to employ as many as possible and hold the forces together. Rumors of a shutdown are denied by company officials, as they are hopeful that the trade will improve in the near future.

A Storage Charge on Ore shipped from the Minnesota ranges to the head of the Lakes will be imposed during the coming season, according to new tariffs on file by the ore-carrying railroads. Shippers have been notified that, effective Mar. 15, a storage charge of ¼c. per ton per day will be charged on all ore remaining in cars more than 10 days. The same document carries the information that last year's rates of 95c. per ton for transportation and 5c. per ton dock charges will continue effective.

A Severe Curtailment of Operations has followed closely the opening of ore shipments from the Lake Superior district. Many mines remained on the shipping list for one day only, and many others, which had shipped for several days, have since stopped and reduced their operating forces considerably. Independent operators are shipping practically nothing, and the Steel Corporation is loading slowly. A variety of reasons, ranging from non-appearance of boats to a poor ore market, are assigned, but the fact seems to be that the condition of uncertainty permeating the steel business because of the railroad price squabble has been reflected on the ore business.

A Worker's Manual in the form of a handbook covering all phases of mining on the Minnesota ranges is to be published by the Engineers' Club of Northern Minnesota, and work has been started on it. Each phase of the work will be covered by a separate treatise, and each treatise will embody not only the writer's experience and knowledge, but also the best that can be selected from present literature on the subject and through collaboration with other men in the same line of work. L. D. Davenport is editor-in-chief and the following assistants have been selected to aid in the work: A. B. Holley, mechanical; W. E. Bates, underground mining; F. R. Mott and E. P. Ericson, steam-shovel mining and stripping; H. S. Rankin, concentrators; Ellery Anderson, ore grading; Odin Sundness, ore sampling and analysis; A. E. Anderson, blasting; W. F. Simpson, milling; F. E. Downing, mining costs; B. K. Dutton, screening plants; H. J. McInnins, iron ores, value, market, and similar subjects; A. C. Borgeson, ore drying; A. F. Benson, magnetic ores and treatment; A. A. Krogdahl and W. W. Sullivan, safety and "first aid"; F. A. Wildes, mine inspection; H. E. Loye, glossary of mining terms; J. F. Wolff, geology; C. M. Boss, history; and W. L. Taylor, explorations.

Experimentation in Peats, of which there are great quantities in northern Minnesota, has been conducted by the office of F. A. Wildes, engineer of state mines. These experiments were first undertaken with the idea of developing peats for fuel, steam and domestic, and thus releasing Minnesota from the domination of the coal operators, whose prices are high. But it has now developed into an attempt to utilize peat for the beneficiation of paintrock, a lean iron ore high in silica and alumina and charged with moisture. Most mines on the Mesabi and other ranges carry a considerable tonnage of this material, not only valueless but a positive detriment to the miners, as it exists in strata that must be removed to get at the merchantable ore beneath. The experiments have been conducted on paintrock from two mines owned by the state's school fund, the total available tonnage from which is understood to be about 80,000,000 tons, and whose paintrock is supposed to be in the neighborhood of 20,000,000 tons. This latter runs from 30 to 40% iron and contains from 20 to 30% of water. Mixed with peat in a pugmill in the proportion of about 5% of peat to 95% of paintrock, pressed into briquets and burned, it becomes a hard somewhat porous, red ore of from 50 to 51% iron. It is non-bessemer, and that coming from these two mines contains from 1 to 1.5% manganese. This sort of ore is commercial in all probability, although its silica and alumina are as high as 15% or even more, and it has practically no lime nor magnesia. The state does not appear to regard this high silica as precluding the enterprise.

It has been estimated that there are in northern Minnesota not less than seven thousand million tons of peat, and the late Charles A. Davis, peat expert of the U. S. Bureau of Mines, stated that it is equal in all respects to peat that is used in other countries. It contains a considerable volume of ammonium sulphate, and the experiments of the state show a saving of about 150 lb. per ton of dry peat; also other valuable byproducts in quantity. Assistant State Engineer Hindshaw, who has been conducting these experiments, estimates that the state has a value in this peat far in excess of what it has in iron ore. How much paintrock there may be in the mines of northern Minnesota is impossible to estimate, but if the central portion of the Mesabi Range runs on the average as do the two mines referred to, it is probable that not less than 100,000,000 tons of 50% ore might be made from it.

SPOKANE, WASH.—Apr. 25

Much Activity in the Gold Camps of central Idaho, especially at Elk City, Orogrande, and Buffalo Hump, is predicted during the coming summer as a result of the announcement made by the acting director of the Bureau of Public Roads,

Washington, D. C., that a first-class wagon road will probably be constructed from Harpster to Elk City. It is officially announced that the survey of the road is to begin soon and that actual construction will follow as promptly thereafter as is practicable. The estimated cost of the road is $300,000. It will connect at Harpster with a good road to be constructed to that point from Stites, the terminus of the Clearwater branch of the Northern Pacific, 13 miles distant from Harpster. The expense of building this road is to be defrayed by the citizens of Stites. Mining men of Spokane and vicinity are extensively interested in the districts to be given transportation by the new road through the National Forest Reserve. Many properties have been developed to the point of production, and the owners have been waiting for transportation. With this provided, active operations will be started. It is believed that development of a number of promising prospects in the territory will begin as soon as the contract is awarded for the construction of the Government road.

AUSTIN, TEX.—Apr. 26

Blue Sky Law on the statute books at present has proved wholly inadequate in preventing the organization of dishonest and irresponsible oil-stock-selling companies. Enormous amounts of worthless securities have been sold to innocent people in Texas and other states during the last several months. It is estimated that many millions of dollars have been paid for stocks that have no value whatever. According to reports, organizations of holders of these stocks have been formed in Dallas and other towns for the purpose of investigating the standing of the various companies and to protect the stockholders' investments. The Dallas organization is called the Texas Oil Investors' Protective Association. W. J. Condon, who was elected president, said that the organization would be state-wide in scope, and one of the first acts would be the investigation of several companies which promised dividends but have failed to pay any.

BIRMINGHAM, ALA.—Apr. 26

No Fatal Mine Accidents occurred in 1918, which sets a new record. Other accidents showed a decrease, and, in view of the conditions, which made necessary the employment of considerable unskilled labor, the record is a good one. This is the first time in 29 years that the mines of this state had not a fatality in a 12-months' period.

The Alabama State Legislature has before it a compensation act which probably will be enacted into law. The act was discussed at the January session, but the labor representatives and the employers were unable to agree on a suitable bill. The mining interest as a whole will welcome any law that provides a fair and equitable compensation for injuries received while in performance of duties.

Operations Are Coming to a Standstill and little of note is taking place in this district. The most important change in iron and steel operations to be recorded during the third week of April is the closing down of the Tennessee Coal, Iron and Railroad Co.'s furnace at Oxmoor, Ala. This curtailment of production will be balanced by the expected blowing in of the company's furnace at Ensley, Ala., which had been down for repairs. Two furnaces at Bessemer, Ala., are expected to begin operations soon, a considerable amount of iron being required in the manufacture of steel. The Oxmoor furnace, just closed down, is said to be the oldest operative furnace in the district and had been in continuous operation for the last six years.

With the exception of the increase of the Tennessee company, already mentioned, there is little prospect for larger output from any of the other companies. The Tennessee company is undoubtedly the best equipped to meet the present quiet pig iron market, as a large proportion of the iron manufactured goes to the company's own plants in various parts of Birmingham, notably the steel plant at Ensley, Alabama.

A further step in curtailment of production of iron was made in this district during the fourth week of April, when the Tennessee company's ore mines at Muscoda, Ala. (Muscoda division, Bessemer, Ala.) discontinued night work with the exception of that at the company's No. 6 mine.

WASHINGTON, D. C.—Apr. 26

Increased Freight Rates put into effect by the Railroad Administration were protested in a complaint filed by 11 large mining companies with the Interstate Commerce Commission. The complainants are the American Smelting and Refining Co., American Smelters Securities Co., United States Zinc Co., Garfield Smelting Co., Baltimore Copper Smelting and Rolling Co., Consolidated Kansas City Smelting and Refining Co., Federal Lead Co., Ray Consolidated Copper Co., Utah Copper Co., Chino Copper Co., and Nevada Consolidated Copper Co. Relief from the unjust rates alleged and compensation for the overcharges claimed were asked. It was also requested that the carriers be requested to establish transit rates through Baltimore such as are in effect through other refining points.

TORONTO, ONTARIO—Apr. 26

Discovery of Platinum in Eby Township is causing much interest among mining men. A strong sulphide dike running across the Baldwin gold property is believed to contain this mineral, which is known to occur with sulphides in the Sudbury district. A party of 30 men left Toronto on Apr. 24 to inspect the Baldwin mine and make investigations as to the occurrence of platinum in the locality.

Regulation of Use of Natural Gas is provided in a bill introduced in the Ontario Legislature by Hon. G. Howard Ferguson, Minister of Lands, Forests, and Mines. It gives the Minister power to shut off the supply of any company or individual; to regulate the construction of machinery using natural gas and the division of fields of production between producing companies; to order the closing of gas wells or works; and generally to exercise control of the production, transmission, and consumption of natural gas for the purpose of conservation.

Important Amendments to Mining Laws of Ontario were made by the Provincial Legislature during the session just closed. The principal changes provide more stringent regulations to prevent accidents and disease which have been rendered necessary by the larger scale upon which mines have latterly been operated and the introduction of deep mining. The regulations as regards sanitation, the use and care of explosives, protection in shafts and working places, and similar rules are made much more detailed and specific; and provision is made for frequent inspection of the machinery and equipment to keep its requirements up to the modern standard, especially strict rules being laid down as regards hoisting machinery. An important regulation provides for the testing of a section of the hoisting rope every six months at a testing laboratory, and a monthly examination of the hoisting ropes and the safety appliances of the cages and shaft conveyances. Elaborate provisions are also made for the safety of the workmen employed in blast furnaces, and the rules governing the use of electricity are adapted from those of the Bureau of Standards at Washington. The changes in the law with respect to the taking up and working of mining claims are important, providing that a prospector can locate a group of six iron ore or iron pyrites claims, and do the assessment work on one of them; and that the actual cost of the survey of a mining claim shall count as labor performed under the working conditions at the rate of $4 per day, but for not more than 25 days' labor. Before the act was prepared the changes it embodies were considered by both mine managers and representatives of labor, and its provisions met with the general approval of all concerned.

The Mining News

ARIZONA

Cochise County

BENSON SMELTERY to be started again May 15, according to Charles E. Goetz, who has been in charge of work of rebuilding old plant.

MASCOT (Wilcox)—Machinery of new concentrator being installed.

Gila County

CHILITO, on San Carlos reservation, eight miles north of Hayden, is center of excitement through cutting of 3-in. quartz stringer, in 2-ft. vein, showing gold. Claims have been named Aztlan and Chimera. Owned by Nelson O'Shaughnessy and other New York men. Managed by E. R. Tufts.

Greenlee County

ARIZONA COPPER (Clifton)—Closed No. 4 concentrator at Clifton; reduced working time No 6 at Morenci to 12 shifts per week. Metcalf Division mines, supplying ore to Clifton concentrator, closed on Apr. 15; Coronado Division mines, supplying ore to No. 6, also closed same date for ore production but 1100 adit being driven ahead. About 450 men thrown out by curtailment. Reduction in ore tonnage approximately 50%, based on January, 1919.

ASH CREEK (Duncan)—Worked for 15 years. To install 100-ton cyaniding mill. Silver sulphide, carrying gold in quartz.

Mohave County

SILVER PICK (Kingman)—Bought by C. T. Griffith and E. W. House.

ALCYONE (Oatman)—Near Boundary Cone, under development, now 400 ft. deep; 4 ft. milling ore reported.

GOLD ROAD BONANZA (Oatman)—Drifting on 550 level.

NELLIE (Oatman)—To extend eastward drifting on unwatered 530 level. In Black Range section; managed by H. E. Woods.

OATMAN UNITED (Oatman)—Will continue 600-ft. main shaft to 800 ft. before crosscutting to vein.

RED LION (Oatman)—Developing between Bald Eagle and Ben Harrison claims of Tom Reed.

TOM REED, JR. (Oatman)—Bought by W. A. Brooks and others; shaft 250 ft. deep.

Pinal County

MAGMA COPPER (Superior)—Has acquired all ground of Queen Copper Co., with consideration of $75,000 for 11 adjoining claims. Original Magma ground was two claims of old Silver Queen, held by Queen Copper under option, surrendered after striking copper sulphide. Magma claims to have found nothing by drilling Queen ground, which will be used for long tunnel that will connect main shafts with surface plant.

Yavapai County

GOLD NUGGETS of unusual size found on southern slopes of Bradshaw range. One worth $300 found by Mexican.

GRAND ISLAND (Jerome)—Mineralized quartz vein cut on 500 level. Continuation of ledge developed at 170 feet.

UNITED VERDE COPPER (Jerome)—Contracted for sinking No. 6 shaft, 15 x 15 ft. from 430 to 1650 level.

UNITED VERDE EXTENSION (Jerome)—Grading smeltery townsite at Verde, employing 125 men; 12 miles of streets graded on system radiating from common center; buildings planned involving $2,000,000 cost.

COPPER QUEEN GOLD (Stoddard)—Given verdict of $15,000 in Superior Court against Arizona Binghamton company; sued for $200,000 for alleged breach of contract to take 100 tons of ore a day. Defendant claimed plaintiff was not able to furnish such amount.

Yuma County

CASTLE DOME DISTRICT, 40 miles northeast of Yuma, active. Hull and reorganized United Mines Co. working two shifts. Mabel developed water at 315 ft. for camp and operation of its mill. J. A. McCaddon, of New York, interested.

CALIFORNIA

Amador County

ARGONAUT (Jackson)—Fire practically out and fully confined to 3750 level. New raise being driven to provide new upcast to insure protection of burned area and prevent revival of fire. H. M. Wolfin, mine inspector, supervising the work.

KENNEDY (Jackson)—Operation, interrupted by gases from Argonaut fire, resumed without damage to mine.

CENTRAL EUREKA (Sutter Creek)—Good milling ore developed below 3350 level. Large tonnage going to mill.

Calaveras County

SHEEPRANCH (Sheepranch) — Golden Gate Exploration Co. purchased A. W. Poe Hotel and Sheepranch mine, formerly a large producer, as nucleus of holdings being acquired. Recent development extended to 1550-ft. point. Average width of vein matter said to be 5 feet.

Nevada County

BULLARDS BAR proposed dam, 28 miles west of Grass Valley, on Yuba River, will be 140 ft. long and first section 80 ft. high. Water will be backed up 6½ miles. Tailings from Brandy City hydraulic mines will be impounded in reservoir and overflowing water utilized for electrical power. Mine operators will be charged for storage. Preliminary work began last season. Contracts let to W. F. Mandry and others for hauling machinery and materials to site.

NORTHSTAR MINES (Grass Valley)—Developing on large scale owing to reduced steel and powder costs. Central shaft mill running full capacity.

Trinity County

BONANZA (Trinity Center)—Mill running during winter on ore stored in bunkers before deep snow stopped transportation from mine to mill. To increase extraction and development when weather permits. Snow now 10 ft. deep.

ESTABROOK DREDGE (Trinity Center)—First 20-cu.ft. bucket dredge ever built for placer mining nearing completion. Built by Union Construction Co., Oakland.

PACIFIC DREDGE (Trinity Center)—New ground to be dredged at this and other locations.

COLORADO

San Juan County

HAMLET (Howardsville)—To resume operations. Small force employed in development and repair work.

GOLD FOUNTAIN MINING (Silverton)—Recently incorporated to develop Gold Fountain property near Silverton. O. C. Hand, president; A. W. McArthur, vice-president; N. J. Bradley, secretary-treasurer.

San Miguel County

ALTA (Ophir Loop)—In Gold King basin. Belmont-Wagner Mining Co. to resume operations. Power will be supplied by Western Colorado Power Co. John M. Fox, manager.

BLACK BEAR (Telluride)—Taken over by Smuggler-Union interests; will be developed and operated in conjunction with Smuggler properties. Directorate consists of Bulkeley Wells, president; O. J. Larson, vice-president; Ike Nevala; H. J. Jackson, and E. B. Adams. C. N. Bell, general manager; John L. McMenamin, secretary and treasurer.

PRIMOS CHEMICAL CO. (Vanadium)—Construction of mill on site of old plant destroyed by fire is well under way. Development operations along San Miguel River show considerable commercial ore. Many smaller properties being developed and operated by lessees. Small, independent operators are active in anticipation of market for their product in the near future.

Teller County

DEADWOOD (Victor)—Owned by the United Gold Mines Co.; being operated under lease by Rocky Mountain Leasing Co. of Denver. Shaft being equipped with steam hoist.

KEYSTONE (Victor)—Being developed under lease by E. G. Fink. Has opened vein of sylvanite ore on 400-ft. level south heading.

PORTLAND (Victor)—Veins of high grade opened on Lee 5 and Portland veins at 2130-ft. point, the Roosevelt Tunnel level.

ROOSEVELT TUNNEL (Victor)—Flow from tunnel fallen below 2400 gal. per minute; maximum was above 15,000 gal.

TRAIL (Victor)—Opened 2-ft. vein on 1400 level of Dexter shaft for 25 ft. During March five carloads shipped. This ground being operated under lease by Anderson and Benkelman.

IDAHO

Shoshone County

NATIONAL (Mullan)—Mill shut down, will start about May 1, when installation of new machinery is completed. Enough ore broken to run mill three months. Low-grade copper.

WEST HUNTER (Mullan) — Working under new management. Crosscutting 150 ft. to vein. Three shifts after May 1. Situated between Morning and Hunter properties.

INTERSTATE-CALLAHAN (Wallace)—Stockholders' meeting at Phoenix, Ariz., on Apr. 14 elected C. W. Newton, mine manager, and Gust Carlson, of Duluth, directors. S. S. Titus, of Grand Forks, N. D., and A. L. Warner, of Duluth, reëlected, filling four vacancies. Meet in June to decide removal of main office from New York to Wallace.

REX CONSOLIDATED (Wallace) — Agreement with Red Monarch company to extend crosscut to point under Rex shaft now 700 ft. deep, and raise 200 ft. to connection. Expect to develop new orebodies; also provide drainage and ventilation. Rex company acquired copper mine in Arizona, being equipped with hoist and other facilities. Known as Cima Copper Syndicate.

MICHIGAN

Copper District

MICHIGAN (Rockland) — Shipped 6057 tons of rock in March to the mill. Smelter returns show 26 lb. per ton. First quarter this year, 15,000 tons of rock shipped to mill, averaging 28.3 lb. fine copper. During quarter 17 machines operating, six stoping and 11 drifting and crosscutting.

Gogebic Range

NEWPORT (Ironwood)—As in previous loans, will handle employees' subscriptions, allowing five or six months for payment, the same as the banks do.

OLIVER IRON (Ironwood) — Standard gage tracks being laid to C shaft, East Norrie mine, and E shaft, Aurora mine, preparatory to shipping. Shafts recently equipped with steel headframes, loading pockets and electric hoists, are five-compartment, 20 x 10 ft. 8 in. outside of timber, with steel sets and reinforced-concrete lath; replace three wood-lined shafts now being dismantled. Plan to aid employees in buying Victory Loan notes provides for payment in 10 monthly installments.

Marquette Range

HARTFORD (Negaunee) — Suspended underground operations on May 1 until further notice. There is little available room for stockpiling, and 200,000 tons are ready for shipment. Many of the miners will be given employment at the Rolling Mill mine.

MINNESOTA

Mesabi Range

BENNETT (Keewatin)—Shipping contracts for 1919 re-let to Guthrie & Co. Erecting several small dwellings.

STEVENSON (Keewatin)—Closed down indefinitely Apr. 21, account poor ore market. Corrigan-McKinney property and one of the oldest and most consistent shippers.

ALPENA (Virginia)—Small slide of ground Apr. 12, resulting in one fatality.

MONTANA

Deerlodge County

GREAT FALLS rod and wire plant is running to capacity on domestic business and also Canadian and English. Quality of goods is said to be satisfactory. English concern pronounced wire and rods superior to any yet used.

Silver Bow County

ANACONDA (Butte) — Production and development of silver-zinc bodies increasing. Opened 35-ft. silver-zinc deposit on 500 level of Orphan Girl, of milling grade. Shipping from this shoot in Anglo-Saxon fissure. Drifting on Orphan Girl and Orphan Boy fissures. Operating about 60% capacity.

BUTTE COPPER AND ZINC (Butte)—Silver-zinc orebody recently cut on 1000 level of Emma may be downward extension of orebody now mined on 800, making to the east. Anaconda operating Emma on 50% profit-sharing arrangement. James Brennan, superintendent.

BUTTE & SUPERIOR (Butte)—Tonnage increased to 75% of normal from 50; made favorable contracts with American Metal Co. for smelting concentrates.

CRYSTAL COPPER (Butte)—Will sink from 500 level of Goldsmith mine. Shipping two carloads gold and silver ore monthly. Oreshoots opened in North and South veins. William D. Gibson, superintendent.

DAVIS-DALY COPPER (Butte)—Enlarging 2500-ft. station of Colorado mine preliminary to sinking to 2700 level; objective, three productive fissures cut on the 2500. New steel change house to accommodate 600 men and steel and concrete 800-ton ore bins to be constructed. Operating 60% normal. William Frazier, superintendent.

ELM ORLU (Butte) — Sinking shaft. Raising and drifting in connection with action against Butte & Superior involving extralateral rights on Rainbow vein beneath surface of latter's Black Rock claim. William N. Rossberg, superintendent.

NORTH BUTTE (Butte)—Daily tonnage, 400; copper costs 14.2c. per lb. Development on more than 12 levels; Edith May vein, opened below 3000 level, shows good ore on three levels. L. D. Frink, superintendent.

RAMSDELL COPPER (Butte) — Ramsdell shaft reached 300 level, where Lizzie and Hesperus veins, under lease from Davis-Daly, will be crosscut. Production halted until copper market improves. John D. Pope, superintendent.

TUOLUMNE COPPER (Butte)—Sinking Sinbad shaft of Main Range, now 100 ft. below 800; to cut Spread Delight fissure on 1000 and 1200 levels; expect to reach objective about July 15. Crosscutting for vein on 1000 level will be pushed simultaneously. Daily tonnage, 100. Mose Little, superintendent.

NEVADA

Elko County

ELKORO (Jarbidge)—Started 100-ton mill Mar. 1, 1918. Grinding with March and Hardinge mills. Cyanide process consists of Dorr counter-current system, followed by filtration with Oliver continuous filters. Ore from Long Hike mine giving excellent recovery. Owns or controls 75 claims in district, principal being Long Hike, Starlight and O. K. O. B. Perry, general manager; E. A. Austin, resident manager.

JARBIDGE NEVADA MINING (Jarbidge)—Will use flotation. Company states saving higher with cyanide, but ore developed insufficient to justify much greater cyanide installation expense.

Lincoln County

PIOCHE DISTRICT shipments during week ended Apr. 17 were: Prince Consolidated, 26 cars; Virginia-Louise, 10 cars; Harney (Stindt and Donohue lease), one car.

BLACK METALS (Pioche)—Completing hoisting equipment, preparatory to shipping ore, already broken in stopes.

HARNEY (Pioche)—Stindt and Donohue lease. Rich orebody, first encountered two months ago, increasing in size and contents with depth. Vein, 3 to 9 ft. wide, carries gold, silver, lead, and copper. Smelter returns on April shipments about $16,000; 24 men employed. On Big Five lease, sinking shaft to intersect orebody encountered on adjoining Stindt and Donohue lease.

VIRGINIA-LOUISE (Pioche) — Shipped during March 1650 tons of fluxing ore. Davidson orebody, recently encountered on 2d level, proved length of 220 ft. following high grade on 4th level.

Nye County

TONOPAH SHIPMENTS for week ended Apr. 12 were 7620 tons of estimated gross milling value of $129,540, comparing with 7072 tons the previous week. Producers were: Tonopah Belmont, 2492 tons; Tonopah Mining, 1050; Tonopah Extension, 2100; West End, 957; Jim Butler, 114; Montana, 277; Tonopah Divide, 420; MacNamara, 210; North Star, 52 tons.

NEW MEXICO

Grant County

NEW MEXICO CALUMET MINING (Pinos Altos)—Mining ore from Langston and transporting to mill one mile distant; ore is complex, carrying gold, silver, lead, copper, and zinc. Mill is nearing completion.

A. R. DAVIDSON (Fierro)—Shipments of good-grade copper smelting ore being made; milling ore is being blocked out also.

HANOVER-BESSEMER MINING (Fierro)—Shipments of iron ore continue at rate of 800 tons per day.

BLACK HAWK MINING AND MILLING (Hanover)—Substantial headframe erected on No. 1 shaft, now down 60 ft., on Combination claim. Shaft on "97" claim down 40 ft., where zinc sulphide is found.

EMPIRE ZINC (Hanover)—About 200 tons daily being put through dry concentrator; tailings are stored on ground for future flotation treatment.

REPUBLIC MINING AND MILLING (Hanover)—Developing on 100, 150, and 200 levels. Good grade milling ore being blocked out. Shipments of high-grade zinc-sulphide ore being made at rate of 300 tons per month. Planning for mill.

UNITED STATES COPPER (Hanover)—Shaft No. 2 down 700 ft., where it will be enlarged from two compartment to three, and sinking continued.

BOSTON-HECLA (Lordsburg) — Word received from Boston to begin at once construction of new headframe and double-compartment shaft to be carried to 300 level. Contract for first 40 ft. let. Understood that $75,000 has been subscribed for this work. R. E. Vandruff, of Lordsburg, is president.

LAST-CHANCE (Lordsburg) — Pyramid Mining Co. on Mar. 28 made payment of $10,000, being the third on account. Shipped second car concentrates during March.

WILLIAM DOCKER AND ASSOCIATES (Pinos Altos)—Work on Docker ground in Bear Creek country recently started. Copper-silver ore has been shipped.

NEW YORK

Saratoga County

MACO DEVELOPMENT (Ballston Springs)—Recently incorporated; will erect frame and brick buildings and install machinery at Milton and Greenfield to mine feldspar; cost estimated, $75,000. Ellsworth H. Cohen, Schenectady, N. Y., interested.

SOUTH DAKOTA

Lawrence County

BOLGER (Galena)—Incorporation being perfected to take over this and adjacent ground. Extensive development and erection of mill planned this year.

HOMESTAKE (Lead) — Erie two-yard steam shovel purchased for handling coal at newly constructed bins.

DARK HORSE (Trojan) — Leased to Manion, Stewart & Harris; already shipped several cars to Trojan mill. Idle for 15 years.

TEXAS

DUDLEY MINING BILLS VETOED by Governor Hobby. First bill gave state only $280 per acre royalty, no matter what mineral found; second provided owners of railroad-grant lands either pay taxes on mineral prospects or release rights so prospecting could be resumed.

Brazos County

GULF PIPE LINE CO. (Freeport)—Will build loading docks below Freeport on Brazos River. A subsidiary of Gulf Refining Co.

Fort Bend County

NEW STRIKE ON BLUE RIDGE, near Almeda, by Gulf Production Co., when No. 2 well came in with 1000 to 2000 bbl. per day, caused intense activity in buying leases. Greater portion of dome covered by Bassett Blakely farm of 6000 acres. No. 1 abandoned eight months ago by Gulf Production Co.; drilling for two years. No. 2 capped awaiting storage facilities.

Harris County

HUMBLE OIL AND REFINING CO. (Houston)—Refinery of 60,000-bbl. capacity to be built near Goose Creek; constructing eight 55,000-bbl. tanks. Ten of same capacity to be built at Webster and oil pumped to Goose Creek and to either Galveston or Texas City. Pipe line to West Columbia progressing, and line to Ranger surveyed.

PITTSBURGH STEEL (Houston)—Will establish big warehouse and distributing plant. I. & G. N. cotton sheds temporarily leased until permanent location secured on Houston ship channel.

UTAH

Juab County

SHIPMENTS FROM TINTIC week ended Apr. 19 amount to 151 cars, as compared with 153 cars week preceding; 19 properties shipping.

EUREKA KING (Eureka) — Elected board of directors at stockholders' meeting: Ray Van Cott, G. M. Chiulos, A. E. Moreton, G. W. Bywater, and F. J. Silvester. Mine in good condition and well equipped. Will consider consolidation with recently formed Paymaster Mining Co., adjoining; could be developed through Eureka King shaft.

MAMMOTH (Mammoth)—Net annual proceeds reported to board of equalization, $22,270. Gross income, $386,893, from 21,997 tons of ore produced in 1918.

Salt Lake County

ALTA CONSOLIDATED (Alta)—Connections made with Michigan-Utah aërial tramway. Good shipping season in prospect.

LITTLE COTTONWOOD TRANSPORTATION (Alta)—Better weather making possible clearing up of narrow-gage line from Wasatch; hope to reach South Hecla bins soon.

SOUTH HECLA (Alta)—Stated to have 1000 tons of ore broken and awaiting shipment.

MONTANA-BINGHAM (Bingham)—Delinquent date for recent assessment of 2c. a share extended from Apr. 25 to May 9. Two assessments antedating, for 3 and 10c. a share respectively.

OHIO COPPER (Bingham)—Operations suspended. Production amounted to 5,000,000 lb. copper yearly.

UTAH COPPER (Bingham)—Preliminary figures, March output, 8,366,000 lb. copper, lowest in years. January, 10,335,000 lb. and February, 10,500,000 lb, making quarterly production 29,200,000 lb. Preliminary figures from quarterly reports show 1918 profits to have been $18,945,780, $11.66 a share, as compared with $29,984,868, $18.45 a share, for 1917.

GARFIELD CHEMICAL (Garfield)—Loss from fire month ago said to be placed at $20,000 by adjuster. Greater damage prevented by volunteer fire department. At time was producing about 150 tons of sulphuric acid daily. Present production 50 to 75 tons daily. Used in Utah Copper leaching plant.

WOODLAWN (Salt Lake)—Main tunnel in 1400 ft., and management encouraged by opening of some ore. Grizzly fissure expected in 125 or 150 ft. Shipment to be made from new ore as soon as roads permit.

Summit County

PARK CITY SHIPMENTS, week ended Apr. 19, 1380 tons, compared with 1240 week preceding. Shippers: Ontario Silver, Judge Mining and Smelting, Silver King Coalition, Silver King Consolidated, Daly Mining, and Daly West in order named.

GLEN-ALLEN (Park City)—Mill to be ready for operation soon.

IOWA COPPER (Park City)—Assessment of 1c. a share, payable May 19, levied to meet working expense. Some ore being taken out in development. Contact expected soon on 200 level.

PARK-UTAH (Park City)—Suing Judge Mining and Smelting Co. and heirs of David Keith and Bankers Trust Co. in regard to partitioning Rattler, Rattler No. 2, and Curtis claims, asking that, for equitable partition, the claims be sold and divided.

SILVER KING COALITION (Park City)—Large tonnage being produced from old workings, and new ground on 1300 level being developed. Work begun on 15 leases let on upper levels.

SILVER KING CONSOLIDATED (Park City)—Lead-silver-zinc ore being developed on 250 level of Comstock section for new mill; at present working only one shift owing to partially frozen water supply. Stockpiled 250 to 300 tons of zinc concentrates, averaging 37% zinc. Thaynes Canyon tunnel in 9750 ft. in gray limestone; ore-bearing fissures expected in near future.

Tooele County

IN DUGWAY DISTRICT, 55 miles from railroad, work being done at Silver Queen, (from which small shipment made of silver-lead ore taken out in development), Lucky Star, Metal States Mining and others. Haul to railroad to be shortened and bettered by completion of Lincoln highway over Johnson's Pass.

LION HILL CONSOLIDATED (Ophir)—Taken over by Walter B. Farmer, of Boston, under foreclosure proceedings, and new company—Ophir Metals—formed, capitalized at 2,000,000 shares, par value $2. Old stockholders allowed 200,000 shares at 15c. a share under certain fixed conditions. Operated in early days by Marcus Daly for the Walkers.

WASHINGTON

Ferry County

LAURIER MINING CO., in Boundary district, leased property for one year near Laurier, close to international boundary line, to C. A. O'Neil and five associates, of Coeur d'Alene and Butte. Lessees to receive first $5 received above smelter returns, 75% of the second $5, 50% of the third $5 and 10% of everything above. Chiefly copper-silver content.

Stevens County

LEAD TRUST MINE in Northport district is installing a compressor, engine, and 50-hp. boiler. Machine drills are to be used in advancing Tunnel No. 3, 350 ft. to cut vein found in upper workings. Lower tunnel in 200 ft., giving depth of 500 feet.

WYOMING

Converse County

IN MOSS AGATE AND MULE CREEK FIELDS, situated 16 miles west from Edgemont, S. D., several wells being drilled by larger concerns with encouraging results. Oil reported at depth of 1400 feet.

THE OHIO OIL COMPANY has brought in its second well in the Lusk field at a depth of 3460 ft., with a flow reported at 1500 bbl. per day. Pipe line is to be rushed to completion and will connect field with Lusk, a distance of 20 miles, from which point it will be shipped to refineries at Casper.

LORIMER MINERALS (Lusk)—Operating under lease and making regular shipment of uranium ore, four carloads to date. Ore averages 4% uranium oxide, recovered from quartzite by open-pit methods.

CANADA

British Columbia

FLORENCE SILVER MINING CO., in Ainsworth district, announces dividends will be quarterly instead of monthly and at same rate. Mill to be operated continuously; three shifts employed. Increased earnings will accumulate a surplus above dividend requirements. Silver ore.

Ontario

ADANAC (Cobalt)—Opening oreshoot.

BEAVER CONSOLIDATED (Cobalt)—Development work renewed at 1400 ft.; promising vein encountered. J. H. Black elected director in place of F. B. Mercer.

EDWARDS & WRIGHT (Cobalt)—Unwatering old Green Meehan mine; will start shipments again.

MINING CORPORATION OF CANADA (Cobalt)—Production for 1918 was 1,708,252 oz. of silver, compared with 4,485,541 in 1917, and net profits were $925,760, as compared with $2,557,091. Amount to credit of profit and loss was $3,025,347, as against $3,448,377 for the previous year.

OPHIR (Cobalt)—High-grade vein 4-in. wide encountered at 540 feet.

COTTER (Boston Creek)—Willeston Gold Mining Co. organized to operate this property. Additional diamond drilling will be undertaken.

ONTARIO-KIRKLAND (Kirkland Lake)—Shaft down 320 ft. High record established during the work, sinking 120 ft. and timbering in 30 working days. Crosscut will be run at 300 level to pick up vein which left shaft at 175 feet.

ANZAC (Porcupine)—Diamond drilling. Formerly the Armstrong-Booth, comprising eight claims adjacent to Penaurum. Surface showings good, but never operated extensively.

DAVIDSON (Porcupine)—New vein, reported high grade, encountered at 200 level.

DOME EXTENSION (Porcupine)—Being developed from 6th level of Dome and ore zone entered showing high grade.

McINTYRE (Porcupine)—Sinking drain shaft from 1000 to 1500 level. Developments at 1000 level of Plenaurum reported favorable.

SOVEREIGN (Porcupine)—Funds to carry on development furnished by sale of 300,000 shares treasury stock. Contracted for diamond drilling.

LUCKY CROSS (Swastika)—Taken over by Marigold Mining Co.; will be reopened, shaft will be sunk to 500 level and cyanide plant added to mill.

CHURCHILL (West Shining Tree) — Purchased two additional claims adjoining, giving total of 236 acres. Active development will be started soon.

MEXICO

OIL LANDS are being or will be investigated by commissions from many European nations. Americans are now exploring districts in Chihuahua near the Durango border.

The Market Report

SILVER AND STERLING EXCHANGE

Apr.	Sterling Exchange	Silver New York, Cents	Silver London, Pence	Apr.	Sterling Exchange	Silver New York, Cents	Silver London, Pence
24	4.6550	101⅛	48⅞	28	4.6750	101⅛	48⅞
25	4.6650	101⅛	48⅛	29	4.6650	101⅛	48⅛
26	4.6675	101⅛	48⅛	30	4.6575	101⅛	48⅛

New York quotations are as reported by Handy & Harman and are in cents per troy ounce of bar silver, 999 fine. London quotations are in pence per troy ounce of sterling silver, 925 fine.

DAILY PRICES OF METALS IN NEW YORK

Apr.	Copper Electrolytic	Tin Spot.	Lead N. Y.	Lead St. L.	Zinc St. L.
	15.15		4.85	4.60	
24	@15.20	†72¼	@4.90	@4.65	6.05
	15.25		4.85		
25	@15.30	†72¼	@4.90	4.60	6.05
	15.25		4.85		
26	@15.30	†72½	@4.90	4.60	6.02½
	15.27½		4.80		
28	@15.32½	†72½	@4.85	4.60	6.02½
	15.25		4.80		6.00
29	@15.30	†72½	@4.85	4.57½	@6.02½
	15.30		4.75	4.55	
30	@15.35	†72½	@4.77½	@4.57½	6.00

† Government price.

The above quotations are our appraisal of the average of the major markets based generally on sales as made and reported by producers and agencies, and represent to the best of our judgment the prevailing values of the metals for the deliveries constituting the major markets, reduced to basis of New York, cash, except where St. Louis is the normal basing point.

Quotations for copper are for ordinary forms of wire bars, ingot bars and cakes. For ingots an extra of 0.05c. per lb. is charged and there are other extras for other special shapes. Cathodes are sold at a discount of 0.125c. per lb.

Quotations for spelter are for ordinary Prime Western brands. We quote New York price at 35c. per 100 lb. above St. Louis.

LONDON

Apr.	Copper Standard Spot	Copper Standard 3 M.	Copper Electrolytic	Tin Spot	Tin 3 M.	Lead Spot	Lead 3 M.	Zinc Spot
24	75½	75½	80½	225½	224½	24½	23⅝	35
25	75¾	76	80⅝	226½	225	24¼	23¾	35
26								
28	76¼	77⅛	80½	226	225	24½	24	35½
29	76⅛	76⅛	80½	226	225	24½	24	35½
30	76½	76¼	80⅝	226½	225½	24⅝	24	35⅝

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb.

Metal Markets

NEW YORK—Apr. 30, 1919

The noteworthy features of the metal markets this week were an increase in the business in copper at advancing prices, the exhibition of real pressure in lead, and the failure of zinc to respond to a fair inquiry. In none of the metals has the curtailment of production been sufficient. The strength in copper is due more to the firm stand of the producers, on the ground that present prices are at or below cost of production, rather than to any improvement in the statistical position.

Transatlantic freight rates remain at 1@1½c., with great difficulty, or impossibility, of obtaining early space. Transpacific freights are unchanged at $15.

The highest court of Germany recently delivered judgment to the effect that contracts made before, or extented during, the war in which overseas goods are concerned, are to be regarded as canceled, altered conditions having to be viewed as rendering them permanently impossible.

British papers repeat the reports in German papers that zinc production in Germany has continued large and is now in excess of the domestic demand. The War Metals Co. is reported to be delivering metals to consumers at prices in marks that correspond with 16c. for copper, 3.3c. for lead, 50.5c. for tin and 25c. for aluminum. It is reported that the stocks of copper and brass are relatively large, and there is said to be a certain amount of unrestricted trade in all metals without license, especially in scrap and in copper produced by German mines.

Copper—A considerably larger volume of business for domestic account was transacted than in the previous week, wire drawers being the chief, if not practically the sole, buyers. Brassmakers report a depressed condition in their business, and in previous weeks they covered their immediate requirements pretty well. It was intimated in our report last week that the copper offered from speculative and second hands was nearly cleaned up, and that buyers would have to go to the large producers. This proved to be the case, and they had to pay the prices asked by the producers. The latter ceased selling on the basis of 15⅞c., delivered, on Apr. 24, and most of them raised their price to 15½c., delivered, regular terms, but that was shaded by a few points by some producers until Apr. 30, when the full price was realized on some business of fair size. Right through the week manufacturers apparently stood ready to take larger quantities at 15⅞c., delivered, equivalent to about 15.22½c., cash, New York, but no producers were willing to meet such bids. There are not many producers who are getting a new dollar for an old one at the present prices; wherefore, the firmness of their attitude at present. However, there is undisguised concern over the failure of curtailment of production to be more than so far has developed.

An interesting feature this week was the consummation of some export business, for forward shipment. It appears probable, however, that this business is to be regarded as involving some special conditions rather than as the forerunner of a general resumption of export trade. The real market price in London appears to be 10s. or so below the quotations that are cabled from the Metal Exchange.

Copper Sheets—The base price of copper sheets is 22½c. per lb. Copper wire is quoted at 17@17½c. per lb. f.o.b. mill, carload lots.

Tin—The situation remains unchanged. Everybody is in the dark respecting the position and intentions of the Government and the U. S. Steel Products Co. The situation is absolutely in the hands of the Government. It is foreseen, however, that there are bound to be irregularities when a free market is again permitted, and it is considered to be a reasonable demand that the Government should so apprise the trade of facts that it will be able to make proper preparations. One lot of tin of 99% grade turned up out of warehouse this week and was offered at 71c.

Lead—Real pressure developed in this market, which is not of speculative character, but is ascribable to the simple facts that the production is being maintained at too large a rate and that lead that is being produced has got to be sold. There were numerous rumors of the Government selling lead at low prices, in some cases ridiculously low. There did not seem to be any authenticity in these specific rumors, but it is probable that they had sufficient basis to justify the conclusion that the Government is in some way spoiling the market, which is thin anyhow. On Apr. 30 lead was offered by first hands at 4.77½c. in the morning, without finding buyers, and late in the afternoon it was offered at 4.75c.

Zinc—The market having had a feeble advance to 6.05c., some galvanizers exhibited considerable interest on Saturday and Monday. Some producers refused to talk business at all on the present level of prices, but there were plenty who would. Those who quoted 6.05c., however, failed to get orders, which were taken mainly at 6.02½c. On Apr. 30 sales were made at 6c.

Negotiations with the Government for the taking over of its stock of spelter by producers on lines similar to those of the arrangement for copper are under consideration, but no further progress during the last week is reported.

Zinc Sheets—The quoted price of zinc sheets is $11 per 100 pounds.

Other Metals

Aluminum—Nominal at 33c.

Antimony—An increase in the volume of business was reported, and prices were firmer. We quote spot at 6¾@7c.

Bismuth—Metal of the highest purity for pharmaceutical use is quoted at $3.20 per lb. for wholesale lots—500 lb. and over.

Cadmium—Quoted at $1.40 per lb. in lots of 500 pounds.

Nickel—Ingot, 40c.; shot, 43c.; electrolytic, 45c. per pound.

Quicksilver—Owing to increased demand and reduction in the stocks in New York, which are now light, this market was stronger. We quote $75@77 for California virgin, and $73 for Mexican virgin. San Francisco telegraphs $72, demand fair.

Silver and Platinum

Silver—Prices remain practically unchanged. Shipments to London for the week ended Apr. 26 were 440,000 oz. London cable advices are to the effect that there has been no change in the value of the rupee since about this time last year, but there are grounds for the belief that a further rise is possible.

Mexican dollars at New York: Apr. 24, 77⅛; Apr. 25, 77⅛; Apr. 26, 77⅛; Apr. 28, 77⅛; Apr. 29, 77⅛; Apr. 30, 77⅛.

Platinum—Refined ingot was in strong demand at $100, which we quote.

Palladium—There was an improvement in the demand for this metal. We quote $122½@125.

Zinc and Lead Ore Markets

Joplin, Mo., Apr. 26—Blende, per ton, high, $41.60; basis 60% zinc, premium grades, $38@37; Prime Western, $36@34; sludge, $34@33; flotation, $31@30; calamine, basis 40% zinc, $24@22. Average settling prices: Blende, $37.94; calamine, $24.25; all zinc ores, $37.35.

Lead, high, $63; basis 80% lead, $58@55; average settling price, all grades of lead, $57.43 per ton.

Shipments the week: Blende, 6847; calamine, 308; lead, 1342 tons. Value, all ores the week, $344,330. Shipments four months: Blende, 178,419; calamine, 4880; lead, 24,906 tons. Value, all ores four months, $8,908,150.

Heavier buying by Oklahoma smelters recently threatened with strike indicates a settlement of differences.

With prices still lowering, it looks as if this district may be compelled to discontinue business. Should it come to that, it may be several years before normal resumption of operations will be possible.

Platteville, Wis., Apr. 28—Blende, basis 60% zinc, $39.50 base for premium grade and $38 base for high-lead blende. Lead ore, basis 80% lead, $53 per ton.

Shipments reported for the week are 2125 tons blende, 45 tons galena, and 856 tons sulphur ore.

For the year to date the totals are 31,744 tons blende, 1720 tons galena, and 1917 tons sulphur ore.

During the week 2372 tons blende was shipped to separating plants.

Other Ores

Molybdenum Ore—No business was reported.

Manganese Ore—Buyers indicate prices between 50 and 60c. per unit

Tungsten Ore—There was continued activity, and considerable business was done at $7 for spot and $6.50 for future deliveries. Sales were chiefly of Chinese ore. High-grade ore is held at $10@11, but buyers are unwilling to pay any such prices.

Pyrites—Spanish pyrites is quoted at 20½c. per unit for furnace ore, c.i.f. New York or any South Atlantic or North Atlantic port.

Iron Trade Review

PITTSBURGH—Apr. 29

A few branches of the finished-steel market show slightly increased volume of business, but on the whole the market is even quieter than it was a week ago. In sheets, several large interests report slightly increased bookings in the last week. In one important case the increased rate, if maintained, would permit of operations at 60% of capacity, instead of at the present 50%. In tubular goods there is a slight improvement in buying, and in the oil-country goods branch of this trade orders are practically all that could be desired. Active work is being done in oil-country development, though merchant steel **pipe**, **boiler** tubes, and similar forms remain dull.

Although there have been frequent references throughout the steel trade to the probabilities of there being an "open market," it has become plain that the leaders in the trade have no such expectations, but intend to adhere to existing steel **prices** until there is a change in conditions, or as long as they are able to do so. Their theory is that no great increase in demand would occur through lowering of **prices**, that investors in construction work of various descriptions are not ready to go ahead, and that therefore the most profitable course is to maintain existing prices, as the current everyday buyer will pay them almost as freely as he would pay reduced prices.

As reported a week ago, the steel trade regards the Industrial Board price-stabilization plan as practically a dead issue, and no interest is taken in the so-called "Peek-Hines" controversy, which the Washington dispatches are still discussing.

Steel prices are being held rigidly, nearly all the reports of price cutting being found to be without foundation, or to refer merely to the payment of commissions to middle interests. Orders offered are so small individually that there is little incentive to cut. Buyers interpret the rigidity of the market as indicating that profits are considerable, or producers would not be so afraid of precipitating a drop.

Pig Iron—In eastern Pennsylvania there is actually an open market in pig iron, with competitive prices being quoted. In the western Pennsylvania and Valley districts the furnaces regard the market as open, but they have not received inquiries of sufficient size to justify quoting competitive prices, and the market is quotable, though largely nominal, at the prices which became effective Mar. 21. The largest sales reported locally last week were two lots of 100 tons each of foundry iron and one lot of 200 tons of high-silicon bessemer, the foundry iron going at the regular price, though the special bessemer went at an extra of $1.05 per ton, in keeping with the pre-war differential, rather than the large differential allowed under war-time regulations. We quote: Bessemer, $27.95; basic, $25.75; malleable, $26.25; foundry, $26.75; forge, $25.75, f.o.b. Valley furnaces, freight to Pittsburgh being $1.40.

Steel—A large steel interest, usually an important factor in unfinished steel, reports that it has had no inquiries in the last week, and that specifications on contracts have been of only moderate proportions. Middlemen report practically no inquiry. The market is quotable at regular prices: Billets, $38.50; sheet bars and small billets, $42; slabs, $41; rods, $52.

Ferromanganese—Inquiry is extremely light, and re-sale offerings take care of all inquiry, being available at $115@125, delivered, for 80%, whereas the producers' asking price is $150. Spiegeleisen is nominal at about $40 for re-sale 18%, shipping point.

Coke—The Connellsville coke market has not declined in the last week, but is, if anything, a shade steadier, this being due to the production-curtailment program having caught up with the conditions. As to costs, the average operation would make a profit on furnace coke at $3.75 if running full, but would lose when operating at 50% or less, and, as few can operate better than 50%, some are closing entirely, even though thereby they lose their organizations. The spot market is $3.65@3.75 for furnace, with contract settlements likely to be made at about $4 for May deliveries. One operator has given up a contract rather than accept the price for May coke insisted upon by the furnace, this being below $4. Spot foundry coke is $4.25@6, depending on brand, all prices being per net ton at ovens. The byproduct ovens are not offering any coke in the market.

MONTHLY AVERAGE PRICES OF METALS

Silver	New York			London		
	1917	1918	1919	1917	1918	1919
Jan.	75.630	88.702	101.125	36.682	44.356	48.438
Feb.	77.585	85.716	101.125	37.742	42.792	48.027
Mar.	73.861	88.082	101.125	36.410	43.620	48.171
April	73.875	95.346	101.125	36.963	47.215	48.886
May	74.745	99.505	.....	37.940	48.980	.....
June	76.971	99.500	.....	39.065	48.875	.....
July	79.010	99.625	.....	40.110	48.813	.....
Aug.	85.407	100.292	.....	43.418	49.077	.....
Sept.	100.740	101.125	.....	50.920	49.500	.....
Oct.	87.332	101.125	.....	44.324	49.500	.....
Nov.	85.891	101.125	.....	43.584	48.969	.....
Dec.	85.960	101.125	.....	43.052	48.492	.....
Year	81.417	96.772	.....	40.851	47.516	.....

New York quotations cents per ounce troy, 999 fine; London, pence per ounce, sterling silver, 925 fine.

Copper	New York		London			
	Electrolytic		Standard		Electrolytic	
	1918	1919	1918	1919	1918	1919
Jan.	23.500	(a)	110.000	92.238	125.000	106.619
Feb.	23.500	16.763	110.000	78.700	125.000	95.700
Mar.	23.500	14.856	110.000	76.821	125.000	82.071
April	23.500	15.246	110.000	77.300	125.000	82.200
May	23.500	.....	110.000	.....	125.000	.....
June	23.500	.....	110.000	.....	125.000	.....
July	25.904	.....	119.913	.....	134.913	.....
Aug.	26.000	.....	122.000	.....	137.000	.....
Sept.	26.000	.....	122.000	.....	137.000	.....
Oct.	26.000	.....	122.000	.....	137.000	.....
Nov.	26.000	.....	122.000	.....	137.000	.....
Dec.	(a)	.....	118.447	.....	133.167	.....
Year	24.628	.....	115.530	.....	130.507	.....

(a) No Market.

Tin	New York		London	
	1918	1919	1918	1919
January	85.500	67.702	293.227	248.557
February	92.000	66.801	311.525	223.963
March	(a)	67.934	318.875	236.843
April	(a)	72.500	329.905	225.275
May	(a)	.....	364.217	.....
June	(a)	.....	331.925	.....
July	(a)	.....	360.347	.....
August	(a)	.....	380.900	.....
September	(a)	.....	343.905	.....
October	(a)	.....	335.543	.....
November	(a)	.....	323.550	.....
December	(a)	.....	267.736	.....
Av. year	(a)	.....	330.138	.....

(a) No average computed.

Lead	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	6.782	5.432	6.684	5.316	29.00	37.227
February	6.973	5.057	6.899	4.784	29.00	28.675
March	7.201	5.226	7.091	4.992	29.00	27.952
April	6.772	4.982	6.701	4.722	29.00	24.888
May	6.818	.....	6.704	.....	29.00	.....
June	7.611	.....	7.511	.....	29.00	.....
July	8.033	.....	7.750	.....	29.00	.....
August	8.050	.....	7.750	.....	29.00	.....
September	8.050	.....	7.750	.....	29.00	.....
October	8.050	.....	7.750	.....	29.00	.....
November	8.050	.....	7.750	.....	31.20	.....
December	6.564	.....	6.324	.....	40.00	.....
Year	7.413	.....	7.222	.....	30.10	.....

Spelter	New York		St. Louis		London	
	1918	1919	1918	1919	1918	1919
January	7.836	7.272	7.661	6.922	54.000	56.045
February	7.814	6.623	7.639	6.273	54.000	46.150
March	7.461	6.500	7.286	6.150	54.000	38.500
April	6.890	6.465	6.715	6.114	54.000	36.118
May	7.314	.....	7.114	.....	54.000	.....
June	8.021	.....	7.791	.....	54.000	.....
July	8.688	.....	8.338	.....	54.000	.....
August	8.985	.....	8.635	.....	54.000	.....
September	9.442	.....	9.092	.....	54.000	.....
October	8.801	.....	8.451	.....	54.000	.....
November	8.491	.....	8.141	.....	54.100	.....
December	8.163	.....	7.813	.....	56.050	.....
Year	8.159	.....	7.890	.....	54.180	.....

New York and St. Louis quotations, cents per pound London, pounds sterling per long ton.

Pig Iron Pgh.	Bessemer‡		Basic‡		No. 2 Foundry	
	1918	1919	1918	1919	1918	1919
January	$37.25	$33.60	$33.95	$31.40	$33.95	$32.40
February	37.25	33.60	33.95	31.40	33.95	32.40
March	37.25	32.54	33.95	31.40	33.95	29.12
April	36.15	.....	32.95	.....	33.95	.....
May	36.20	.....	33.00	.....	34.00	.....
June	36.36	.....	33.16	.....	34.16	.....
July	36.60	.....	33.40	.....	34.40	.....
August	36.60	.....	33.40	.....	34.40	.....
September	36.60	.....	33.40	.....	34.40	.....
October	36.60	.....	34.40	.....	35.40	.....
November	36.60	.....	34.40	.....	35.40	.....
December	36.60	.....	34.40	.....	35.40	.....
Year	$36.67	.....	$33.70	.....	$34.45	.....

‡ As reported by W. P. Snyder & Co.

STOCK QUOTATIONS

N. Y. EXCH.† Apr. 29	
Alaska Gold M.	3⅛
Alaska Juneau	2
Am.Sm.&Ref.,com.	72½
Am.Sm. & Ref., pf.	106
Am.Sm.Sec., pf., A	93
Am. Zinc	14
Am. Zinc, pf	48½
Anaconda	62⅛
Batopilas Min	1⅛
Bethlehem Steel	74
Butte & Superior	22½
Butte Cop. & Zinc	7⅛
Cerro de Pasco	43½
Chile Cop	22⅛
Chino	36½
Colo. Fuel & Iron	43½
Crucible Steel	72⅛
Crucible Steel, pf.	94
Dome Mines	14
Federal M. & S.	12
Federal M. & S., pf.	38
Great Nor., ore ctf.	43⅛
Greene Cananea	39½
Gulf States Steel	54½
Homestake	89
Inspiration Con.	49½
International Nickel	26⅛
Kennecott	32⅛
Lackawanna Steel	72
Mexican Petrol.	176⅛
Miami Copper	23⅛
Nat'l Lead, com.	72⅛
National Lead, pf.	108
Nev. Consol.	16
Ontario Min.	7⅛
Ray Con.	20⅛
Republic I.&S., com.	82½
Republic I.&S., pf.	103⅛
Sloss-Sheffield	53⅛
Tennessee C. & C.	14⅛
U. S. Steel, com	101⅛
U. S. Steel, pf.	116⅛
Utah Copper	76⅛
Va. Iron C. & C.	60
Worthington Pump	68

BOSTON CURB* Apr. 29	
Alaska Mines Corp.	‡.12
Boston Ely	1⅛
Boston & Mont.	.68
Butte & Lon'n Dev.	.12
Calaveras	.50
Chief Con	3⅛
Contact	.05
Corbin	‡.25
Cortes	.12
Crown Reserve	.38
Crystal Cop.	.21
Eagle & Blue Bell	2⅞
First Nat. Cop.	1⅛
Houghton Copper	.20
Intermountain	‡.05
Iron Blossom	.40
Iron Cap	.13
Majestic	.17
Mexican Metals	.15
Mines of America	‡.05
Mojave Tungsten	.11
Nat. Zinc & Lead	.14
Nevada-Douglas	.10
New Baltic	1
Oneco	.20
Pacific Mines	‡.25
Rex Cons.	.12
Yukon Gold	.76

SAN FRAN.* Apr. 29	
Alta	.04
Andes	‡.25
Best & Belcher	.23
Caledonia	.24
Challenge Con.	‡.03
Confidence	‡.03
Con. Virginia	2.10
Gould & Curry	.09
Hale & Norcross	‡.17
Jacket-Cr. Pt.	.10
Mexican	.46
Occidental	.40
Ophir	1.05
Overman	.10
Savage	‡.25
Sierra Nevada	.18
Union Con.	.38
Utah Con.	.04
Belmont	‡3.00
Jim Butler	.31
MacNamara	.83
Midway	.46
Mont.-Tonopah	.20
North Star	.09
Rescue Eula	.14
West End Con.	1.80
Atlanta	.04
Booth	‡.30
Comb. Frac.	‡.03
Florence	.40
Jumbo Extension	.10
Kewanas	.04
Nevada Hills	.06
Nevada Packard	‡.20
Round Mountain	.39
Silver Pick	.12
White Caps	.36

COLO. SPRINGS* Apr. 29	
Cresson Con.	5.00
Doctor Jack Pot	.04
Elkton Con.	.04½
El Paso	.18
Gold Sovereign	‡.02
Golden Cycle	1.88
Granite	.15
Isabella	.05
Mary McKinney	.06
Portland	1.00
United Gold M.	.18
Vindicator	.30

BOSTON EXCH.† Apr. 29	
Adventure	.50
Ahmeek	.71
Algomah	.25
Alloues	.35
Ariz. Com.	11⅛
Arnold	‡.20
Bingham Mines	‡17⅛
Bonanza	‡.10
Butte-Balaklava	‡.30
Calumet & Ariz.	59½
Calumet & Hecla	395
Centennial	‡12
Copper Range	42½
Daly West	2⅛
Davis-Daly	5⅛
East Butte	8⅛
Franklin	2⅛
Granby	66½
Hancock	16
Hedley	‡12
Helvetia	‡.25
Indiana	‡.50
Isle Royale	25
Keweenaw	‡1⅛
Lake	7⅛
La Salle	‡2
Mason Valley	‡2⅛
Mass	4⅛
Mayflower	4⅛
Michigan	‡2⅛
Mohawk	57
New Arcadian	‡1⅛
New Cornelia	17⅞
New Idria	‡9⅛
Nipissing	8⅛
North Butte	10
North Lake	‡.25
Old Dominion	33⅛
Osceola	49
Quincy	56
St. Mary's M. L.	43
Santa Fe	‡.25
Seneca	‡13⅛
Shannon	2
Shattuck-Ariz.	‡11
So. Lake	‡75
So. Utah	‡.12
Superior	15⅛
Superior & Bost.	2⅞
Trinity	12⅛
Tuolumne	‡.81
U. S. Smelting	50⅛
U. S. Smelting, pf.	46⅛
Utah Apex	2
Utah Con.	7⅛
Utah Metal	1⅛
Victoria	12⅛
Winona	.80
Wolverine	15

N. Y. CURB† Apr. 29	
Am. Tin & Tung.	‡⅛
Big Ledge	‡1
Butte & N. Y.	‡1
Butte Detroit	‡.04
Caledonia	.32
Calumet & Jerome	‡⅛
Can. Cop. Corpn.	1⅛
Carlisle	‡2
Cashboy	.10
Con. Ariz. Sm.	1
Con. Coppermines	‡5
Goldfield Con.	.18
Goldfield Merger	.05⅛
Hecla Min.	4
Howe Sound	‡3⅛
Jerome Verde	‡⅛
Louisiana	1
Magma	‡31
Marsh	.07
McKinley-Dar-Sa	‡.48
Milford	‡.75
Mother Lode	.41
Nixon Nevada	.19
Ohio Cop.	‡.80
Rawley	‡2⅛
Ray Hercules	2⅛
Richmond	‡.50
Rochester Mines	.20
St. Joseph Lead	11
Standard S. L.	‡⅞
Stewart	.36
Success	‡.05
Tonopah	‡3⅛
Tonopah Divide	10⅛
Tonopah Ex.	2⅞
Tribullion	‡.35
Troy Arizona	‡.10
United Eastern	4⅛
United Verde Ext.	‡32⅛
United Zinc	‡1
Utica Mines	‡.05

TORONTO* Apr. 29	
Adanac	.17
Bailey	.03
Beaver Con.	.45
Chambers Ferland	‡.10
Coniagas	2.00
Hargraves	.02
Kerr Lake	5.37½
La Rose	.25
Lake Shore	.93
Min. Corp. of Can.	2.00
Peterson Lake	06
Temiskaming	.34
Wettlaufer-Lor.	.04
Davidson	‡.68
Dome Exten.	.27
Dome Lake	.24
Hollinger	6.37½
McIntyre	1.62½
Newray	.12½
Pocu. Crown	.25
Teck-Hughes	.18
Vipond	.20
West Dome	.12

* Bid prices. † Closing prices. ‡ Last quotations.